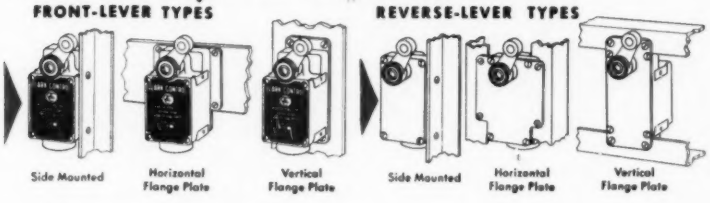
NEW!

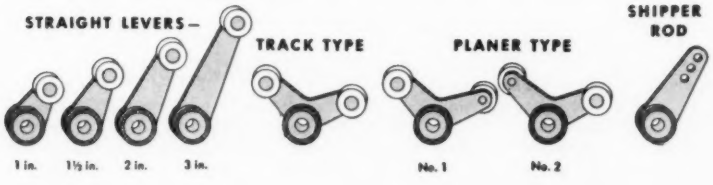
CLARK *Type DM* MACHINE LIMIT SWITCH

• This new heavy-duty limit switch is built with a minimum of moving parts, and with emphasis on simplicity of construction. The primary objective in its design is to provide dependable, accurate, trouble-free operation for a long life. All latch and trip-bearing surfaces are nylon to steel for minimum wear. All springs are in compression for greatest safety—they cannot be overloaded. This and other features make the switch as nearly fail-safe as possible.

Mounting Arrangements



Operating Levers



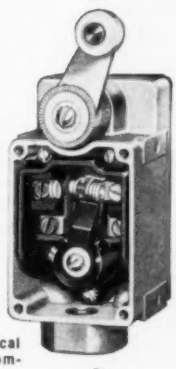
Nylon roller cushions impact, has low friction coefficient and long wearing qualities.

Reversible operating lever. Simple screw driver adjustment for reversing or positioning.

Heavy molded insulating chamber surrounds all live parts and provides ample wiring space for four No. 12 wires with Stakon connectors.

Areas subjected to arcing are protected by glass-melamine plates.

Electrical and mechanical sides of switch are completely isolated.



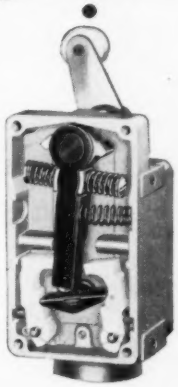
Nema Type 5 dust-tight, oil-tight enclosure of heavy die-cast construction.

Double-concentric overtravel springs in compression for fail-safe operation.

Return spring is in compression. Can be changed without tools to either side of arm, or removed for maintained contact.

Spring-loaded latches are nylon for low friction and long life.

Choice of ½" or ¾" conduit opening.



Write for Bulletin 102DM

The **CLARK** **CONTROLLER** *Company*

Engineered Electrical Control

1146 East 152nd Street • • Cleveland 10, Ohio

For more facts circle 502 on Reply Card

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'ROUND ABOUT with the editors in field and office

Edited by R. L. Marinello

Personnel Appointments

Elmer L. Harrison was recently appointed to the new combined post of tooling superintendent and master mechanic for the Clary Multiplier Corp., San Gabriel, California.

Harrison has been superintendent of tooling since 1949. With his added duties as master mechanic, he will have charge of machine as well as tooling installations and development of new machine methods.

A. C. Moore, general manager of the Aircraft Engine Division, Ford Motor Co., 7401 S. Cicero, Chicago, announced the appointment of **E. M. Sirhal,** to manager of plant engineering.

Chicago Will be Host Again

PLANT ENGINEERS will be interested to know that the Plant Maintenance and Engineering Show and Conference for 1955 will be held in the Expanded Section of the International Amphitheatre, Chicago, from January 24 to 27, 1955.

Don't forget to make a note of this event on your calendar. More information and details of the discussions that will take place at the next Conference will be announced at a later date.

Hot Dip Galvanizers' Conference

SEMI-ANNUAL meeting of the American Hot Dip Galvanizers Association, Inc., will be held at the Hotel Dennis, Atlantic City, New Jersey, on September 16 and 17.

Highlighting the two-day conference will be the unique Problems Clinic Session, which has become the outstanding open forum discussion on hot dip galvanizing plant operations and field performance.

Guest speakers will include Mr. Oscar Olson of the Olson Engineering Co., Inc., Pittsburgh, Pa., who will present a paper about the latest developments in galvanizing kettles. Government representatives are expected to bring the members up to date on the latest development in Federal hot dip galvanizing specifications. A full report on the new ASTM hot dip galvanizing specifications will also be given by the Association Committee working with ASTM.

Maintenance Costs to Double

INDUSTRY IN THE next 10 years will double its maintenance expenditures to about 22 billion dollars annually. This was forecast during a recent Cleveland speech by H. F. McCullough, general manager of General Electric Company's Service Shops Department.

McCullough said industry must direct the same degree of management skill to

H. F. McCullough predicts maintenance costs will double in the next ten years

maintenance functions that is now devoted to production. Present and future production demands require the training of highly skilled and well planned maintenance to prevent idle machinery.

Today's stepped-up production, combined with increased labor, materials and equipment costs, dictates a scheduled maintenance program. With the trend towards automation in industry, the need for programmed maintenance has been emphasized even more strongly in certain areas. Some aircraft and automotive industries, for example, have already applied electronic computors to simplify programming for maintenance executives.

The G-E program, outlined at the forum, covered five basic steps which can aid industry in increasing productivity: (1) Gather complete equipment data; (2) evaluate routine maintenance so that cost of equipment will show how much care is warranted; (3) establish a routine operating control system; (4) evaluate critical maintenance needs; and (5) establish a critical maintenance program.

Reducing Industrial Noises

HOW CAN INDUSTRY reduce machinery noise? This question will be the theme of the fifth annual National Noise Abatement Symposium to be held October 21 and 22 on the campus of Illinois Institute of Technology, Chicago.

The symposium will emphasize noise reduction in order to make people more conscious of what can and has been done in the field of noise abatement. Plant

Plant Engineering is published monthly at Chicago, Ill. Subscriptions one year $10 in the U. S. A. Canada $11; Elsewhere $12. Acceptance under Section 34.64, P. L. & R. authorized by Post Office.

Assembly Line Steam Trap Maintenance Saves Time and Money

It costs less to repair a group of traps before they all need it than to wait and repair one at a time

CHART I — COST OF LABOR FOR ONE TRAP

(assuming labor at $2.00 per hr.)

LABOR	MINUTES	COST
Get parts from store room	3	
Get tools	2	
From store room to trap	5	
Shut off steam	1	
Wait for trap to cool	5	
Remove cap and mechanism	2	
Replace Valve, Seat and Lever Assembly	4.5	
Remove old gasket and clean gasket surface	2	
Apply gasket dope	1	
Put on new gasket	1	
Install cap with mechanism	2	
Turn on steam	1	
Back to shop	5	
TOTAL PER TRAP	34.5 min.	$1.15
TOTAL COST OF LABOR FOR 8 TRAPS SERVICED INDIVIDUALLY	4 hr. 36 min.	$9.20

CHART II — COST OF LABOR FOR 8 TRAPS SERVICED AT ONE TIME

(assuming labor at $2.00 per hr.)

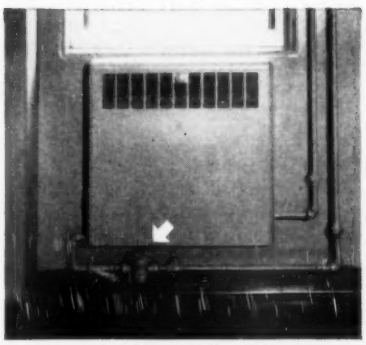
LABOR	MINUTES	COST
Get parts from storeroom	3	
Get tools	2	
From storeroom to trap	5	
Shut off steam	1	
Wait for traps to cool	5	
Remove caps and mechanisms	16	
Replace Valves, Seats and Lever Assemblies	36	
Remove old gaskets and clean gasket surfaces	16	
Apply gasket dope	8	
Put on new gaskets	8	
Install caps and mechanisms	16	
Turn on steam	1	
Back to shop	5	
TOTAL	2 hr. 6 min.	$4.20

ARMSTRONG traps do not demand constant attention, but when they do need repairs, maintenance money can be saved by replacing parts not only in the trap requiring immediate attention, but also, in the remaining traps of that series.

For example, assume eight traps were installed on an eight-coil dryer at the time of its installation. When one of these traps becomes worn to the point of needing replacement parts, there is a direct savings if *all* the traps receive new internal mechanisms at the same time.

Several traps draining the same machine, receive approximately the same wear. When one trap becomes worn to the extent of needing new internal parts the others will be soon to follow.

If the remaining traps have an average of 10% service life, before requiring repair, and the cost of a new valve, seat and lever assembly were approximately $4.00, replacement before absolutely necessary would involve a loss of $0.40 per trap. However, the labor cost involved will more than make up for this loss.



Armstrong No. 800 draining a convector at Globe Steel Tubes Company. Parts for this trap cost only 2¼ cents per year. Average trap life is 11 years.

Chart I shows that the cost of labor involved to service one trap is $1.15. Therefore, repair labor for eight traps serviced individually would cost approximately $9.20.

Chart II shows the cost of labor involved to service all eight traps at the same time. Here we find the labor cost is only $4.20. This leaves a labor profit of $5.00.

The loss of $0.40 per trap times the remaining seven traps is $2.80. Subtracting $2.80 from $5.00 leaves a profit of $2.20 gained by servicing all eight traps at the same time.

Thus, if traps are put on regular maintenance schedule and assembly-line servicing is employed, a very definite profit can be shown, plus the assurance of maximum operating economy at all times. Traps are kept in tip-top shape, eliminating steam or fuel waste that might occur if the trap is not caught before it goes bad.

Your local Armstrong Representative has parts in stock and valuable trap service knowledge to help you. Call him, or write:

ARMSTRONG MACHINE WORKS
912 Maple Street • Three Rivers, Michigan

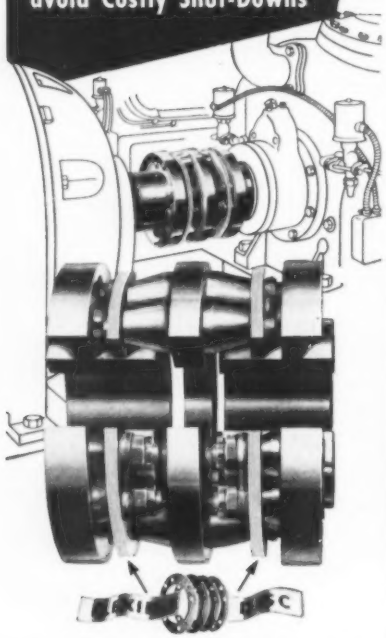
FREE MAINTENANCE BULLETINS—

Bulletin No. 239 is an 8-page trap Service Guide; Bulletin No. 292 tells how to save money on trap repairs. Send for them — no obligation.

ARMSTRONG STEAM TRAPS

For more facts circle 503 on Reply Card

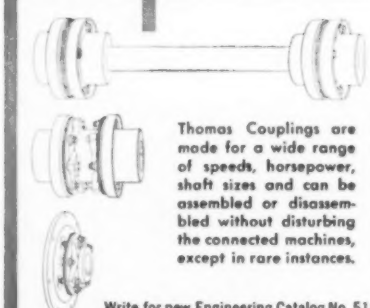
Specify THOMAS ALL METAL
FLEXIBLE COUPLINGS
for Power Transmission to avoid Costly Shut-Downs



Patented Flexible Disc Rings of special steel transmit the power and provide for parallel and angular misalignment as well as free end float.

DISTINCTIVE ADVANTAGES

FACTS	EXPLANATION
NO MAINTENANCE	Requires No Attention. Visual Inspection While Operating.
NO LUBRICATION	No Wearing Parts. Freedom from Shut-downs.
NO BACKLASH	No Loose Parts. All Parts Solidly Bolted.
CAN NOT "CREATE" THRUST	Free End Float under Load and Misalignment. No Rubbing Action to cause Axial Movement.
PERMANENT TORSIONAL CHARACTERISTICS	Drives Like a Solid Coupling. Elastic Constant Does Not Change. Original Balance is Maintained.



Thomas Couplings are made for a wide range of speeds, horsepower, shaft sizes and can be assembled or disassembled without disturbing the connected machines, except in rare instances.

Write for new Engineering Catalog No. 51A

THOMAS FLEXIBLE COUPLING CO.
WARREN, PENNSYLVANIA, U.S.A.

For more facts circle 504 on Reply Card

'ROUND ABOUT

problems will be analyzed in discussions on noise control of machinery, handling of materials, testing of products and the sales appeal of quiet products.

Included in the meeting will be a tour of the acoustical laboratories of Armour Research Foundation and a series of roundtable discussions on recent developments in noise abatement legislation, medical advances in hearing problems, psychological aspects of noise as they affect sales of machinery and vehicle construction noises in cities.

Additional information on this symposium may be obtained from Neil Ruzic, Illinois Institute of Technology, 35 West 33rd St., Chicago 16, Illinois.

Cooper Alloy's Plant Engineer

APPOINTMENT of **Arthur Tauscher** to the position of plant engineer of The Cooper Alloy Foundry Co., Hillside, New Jersey, was recently announced by W. P. McKown, Jr., Works Manager. He will be in charge of maintenance and construction.

Mr. Tauscher is a graduate of New York University, where he received his Civil Engineering degree. He comes to Cooper Alloy with a background that includes responsibility for general plant operations, as well as supervision of maintenance construction and allied purchasing activities.

He served as a captain with the U. S. Army Corp of Engineers in World War II and as a major with the Corps of Engineers during the Korean conflict.

New Plants A-Building

General Motors will build a new Fisher Body fabricating plant on the site of GM's former Detroit Transmission Division plant in Livonia, Michigan . . . To provide better customer service for expanding markets for special chemicals, the **Pennsylvania Salt Manufacturing Co.** will add two new plants. These plants will be constructed at Delaware, Ohio, and Chicago Heights, Illinois . . . **Coyne Cylinder Co.** is completing construction of its new plant at Memphis, Tennessee, which will house both production facilities and offices . . . Plans to construct additions to **Ford Motor Co.** stamping plants in Cleveland, Ohio, and Buffalo, New York, were recently announced . . . Construction work on an ammonia producing plant is underway at **Columbia-Southern Chemical Corporation's** chemical manufacturing operation in Natrium, West Virginia . . . In addition to acquiring a modern manufacturing plant in the Toronto area which will start operations this fall, **Robertshaw-Fulton Controls Co.** is expanding its plant at Anaheim, California, and constructing a new plant in Long Beach, California . . . **Franklin Electric Co., Inc.**, will double its manufacturing facilities with an addition which is planned for its Bluffton, Indiana, plant . . . **S & W Fine Foods, Inc.**, plans to erect a new office headquarters and a combined warehouse and coffee processing plant near the San Francisco-San Mateo County line.

Both Smiths Move Up

George S. Smith has been appointed director of engineering and a vice president of the Johns-Manville Products Corp., succeeding C. B. Burnett. **Arthur C. Smith** succeeds G. S. Smith as chief plant engineer in the General Engineering Department and Donald E. Hillier succeeds A. C. Smith as production engineer of the J-M Building Products Division.

G. S. Smith, who began his career with Johns-Manville at the Alexandria, Indiana plant in 1929 as plant engineer has been chief plant engineer of the J-M General Engineering Department at Manville, New Jersey, since 1949. In 1930 he was transferred to the Manville, N. J., plant as assistant plant engineer and in 1932 was promoted to plant engineer for all operations at Manville.

Arthur C. Smith joined Johns-Manville at the Waukegan, Illinois, plant in 1940. Five years later he was transferred to Manville, N. J., as project engineer in the General Engineering Department. In 1947 he was promoted to production engineer of the Building Products Division, supervising that Division's large program of plant improvement and expansion.

All About Spray Painting

WHAT TO DO and what not to do will be covered in the Spray Painting Course, conducted by Binks Manufacturing Co. The fall schedule of courses will begin on September 13 through September 17 at the company's Chicago plant.

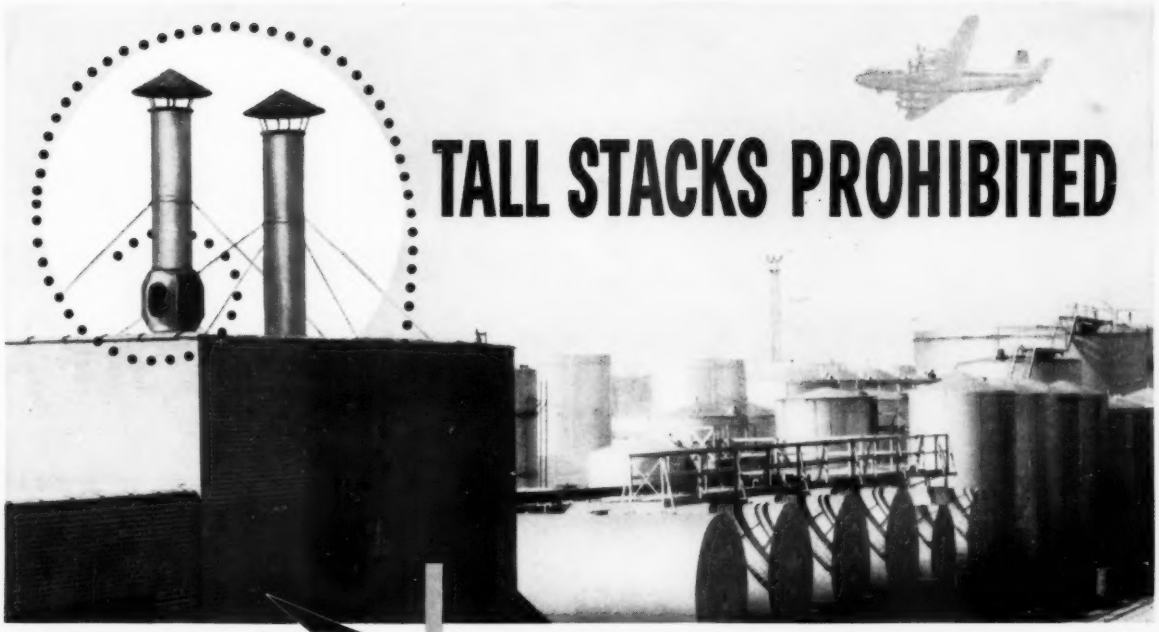
This one-week course is open to all those who are interested in learning modern and proper methods of spray application, and the correct care and maintenance of Spray equipment.

The course will be repeated on October 4 through 8, November 8 through 12; and December 6 through the 10.

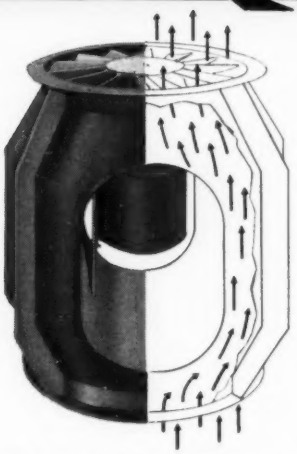
Attendance is limited to 25 so that personal attention can be given to individual problems. First-hand experience in the construction and operation of spray equipment is supplemented with modern audio-visual training aids.

No previous experience in spray painting is necessary to attend the school.

Applications for enrollment should be made as far in advance as possible so that reservations for suitable hotel or other accommodations can be made. Address: E. F. Watts, Binks Manufacturing Co., 3122 Carroll Avenue, Chicago 12, Illinois.



TALL STACKS PROHIBITED



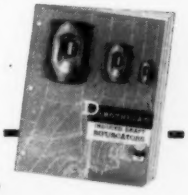
The Induced Draft Bifurcator is a motor-driven axial-flow fan in a divided housing. Motor is in an isolated chamber around which flue gases are by-passed so that motor always remains clean, accessible and at safe temperature. Induced Draft Bifurcators are built in 24 sizes, for high-pressure boilers delivering up to 60,000 pounds of steam per hour and for low-pressure boilers rated up to 190,000 EDR.

So Socony-Vacuum Lubricating Oil Plant insures boiler draft with Induced Draft Bifurcator Fans

This Socony-Vacuum oil blending and packaging plant is located near the Kansas City Airport, so they couldn't erect a tall stack for boiler draft. This restriction posed a problem because the plant requires two 150 HP boilers to provide steam for plant processes, tank car cleaning and barrel cleaning.

Socony-Vacuum engineers solved the problem by installing two Induced Draft Bifurcator Fans. One Induced Draft Bifurcator Fan is mounted in the breeching immediately above the boiler. The other Bifurcator is mounted on the roof because of limited space above boiler smoke outlet. These units provide adequate draft for the two 150 HP boilers — and they require only 12-foot steel stub stacks.

For full information on Induced Draft Bifurcators, simply **MAIL COUPON TODAY.**



DeBothezat Fans
Division of
American Machine and Metals, Inc.
EAST MOLINE, ILLINOIS

DeBOTHEZAT FANS DIVISION
American Machine and Metals, Inc.
Dept. PE-954, East Moline, Illinois

Please send free Bulletin DB-32-52 with full technical data on Induced Draft Bifurcators.

FIRM NAME

ADDRESS

CITY ZONE STATE

NAME AND TITLE

For more facts circle 505 on Reply Card

Announcing a New 15-Ton Crane for Industry

the BUCYRUS ERIE 15-B Transit Crane

Here's big news for materials handling men — the popular Model 15-B crane-excavator is now available with its own rubber-tired carrier. You can now get all the time-and-money saving advantages of a fast moving yard crane with 15-ton capacity, plus the ruggedness and dependability of the field proven crawler-mounted 15-B.

Built exclusively for Bucyrus-Erie Transit Crane duty, the crane carrier has ten speeds forward and two reverse — maximum travel speed of 31 m.p.h. The chassis frame, of welded alloy steel construction, provides a solid foundation for fast operation. Two extendible I-beam type double box outriggers on each side furnish additional support.

The upper works and machinery arrangement is of proven design, basically the same as the 15-B crawler-mounted machine. The revolving frame is a one-piece welded unit of deep box-section design. Conical hook swing rollers — two pairs at the front where the heaviest loads are concentrated, and two single rollers at the rear — give free-running operation that increases ease of swing. Each pair of the front rollers operates in an equalizing frame which distributes loads evenly.

Look over this partial list of important features that make the new 15-B Transit Crane outstanding for fast profitable handling of scattered, diversified materials handling jobs. Then get complete details from your nearby Bucyrus-Erie distributor.

32E54C

check these 15-B Transit Crane Features
● Standard 30-ft. crane boom is extendible to 70 feet with insert sections. Jib extensions can be added without removing sheaves, guards, or suspension ropes.
● Pendant type boom suspension (8- or 16-part) is ideal for changing boom lengths conveniently.
● Power controlled lowering of load on main hook in lifting crane service.
● Power controlled boom hoist, fully independent of all other functions, provides high accuracy boom control for crane work.
● Friction swing brake, in addition to regular swing lock, permits more accurate spotting and holding of boom point over desired position.
● Safety boom stops, designed to prevent boom from accidentally snapping over center and striking cab, furnished on lifting cranes.
● Convertible in the field to ½-yd. clamshell, dragline, shovel or dragshovel.
BUCYRUS-ERIE CO. South Milwaukee, Wis.

For more facts circle 506 on Reply Card

Easily-Installed

OTIS LIGHT DUTY ELECTRIC FREIGHT

For Light Freight

ELEVATORS ARE SELF-SUPPORTING UNITS

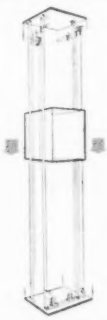
You can have electric power freight handling at relatively low cost.

Otis Self-Supporting Elevators have been designed specifically for hoisting light freight between 2 or 3 floors. They are made in 3 standard sizes with lifting capacities of 1,500, 2,000 or 2,500 lbs. They travel at 25 feet a minute and are suitable for all rises up to 35′-0″.

Otis light duty elevators are self-supporting units. They keep all heavy loads off the building structure. They can be installed in any store, laundry, hospital, storage building, or manufacturing plant quickly and inexpensively.

NO COSTLY ... building reinforcing

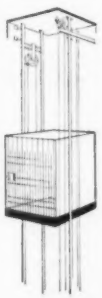
The guide rail structure carries the hoist ropes and sheaves, the elevator car, and the full freight load. Its vertical T-rails and cross channels transfer heavy vertical loads to the bottom of the pit.

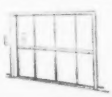


The guide rail structure is attached to the building at each floor and at the top of the hoistway to steady the structure and take light horizontal thrusts.

NO COSTLY ... penthouse

The supporting structure stops at the underside of the roof. Horizontally folding car gates reduce the hoistway headroom requirements above the top landing to 10′-6″. Where extra headroom permits, standard vertical steel gates may be used to leave the full door width clear for loading.

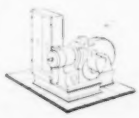




This headroom permits the use of steel vertical bi-parting hoistway doors. They are constructed for long life under the rough handling encountered in freight service.

NO COSTLY ... overhead supports

The hoisting machine is mounted as a complete unit on a concrete foundation at the bottom floor. It is powered by an Otis-built electric motor and operated by an Otis-built controller. The overhead hoist rope sheave is supported by the elevator structure.



* * *

There's no need to delay a change to electric power freight handling. Write for Booklet B-720 or ask any of our 268 offices about Otis Self-Supporting Freight Elevators.

Otis Elevator Company
260 11th Ave., New York 1, N. Y.

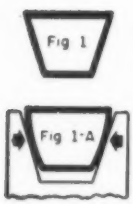
FREIGHT ELEVATORS

HEAVY DUTY · GENERAL DUTY · LIGHT DUTY

For more facts circle 507 on Reply Card

to cut your V-Belt costs--

--just make this simple test!

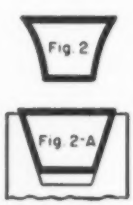


Bend *any* V-Belt that has *straight sides* (Fig. 1). As the belt bends, *feel* the sides *bulge out* (Fig. 1-A). Clearly, the bulging sides are forced to press *unevenly* against the V-pulley—and this *concentrates* the wear at the points shown by arrows (Fig. 1-A). Naturally, this means shorter life for the straight-sided V-Belt.

Now bend the Belt with CONCAVE SIDES...

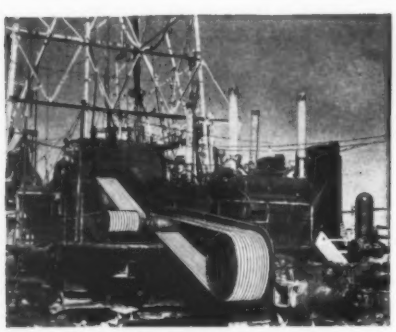
(U.S. PAT. 1813698)

. . . the Gates VULCO ROPE (Fig. 2)



You find that the CONCAVE SIDES *fill out* and become perfectly straight. They thus press *evenly* against the V-pulley (Fig. 2-A). All wear is distributed *uniformly* across the *full width* of the GATES VULCO ROPE— and this means *longer* belt life and *lower* belt costs for you!

When you buy V-Belts, be sure to get the V-Belt with the CONCAVE SIDES... the GATES VULCO ROPE!



Typical Gates Vulco Rope Drive—Gates V-Belts are built with Concave Sides to insure longer belt wear.

Gates VULCO ROPE DRIVES

REG U.S. PAT. OFF.

THE GATES RUBBER COMPANY
DENVER, U.S.A.

• Gates Engineering Offices and Jobber Stocks are located in all industrial centers of the United States and Canada, and in 70 other countries through-out the world.

CS-549

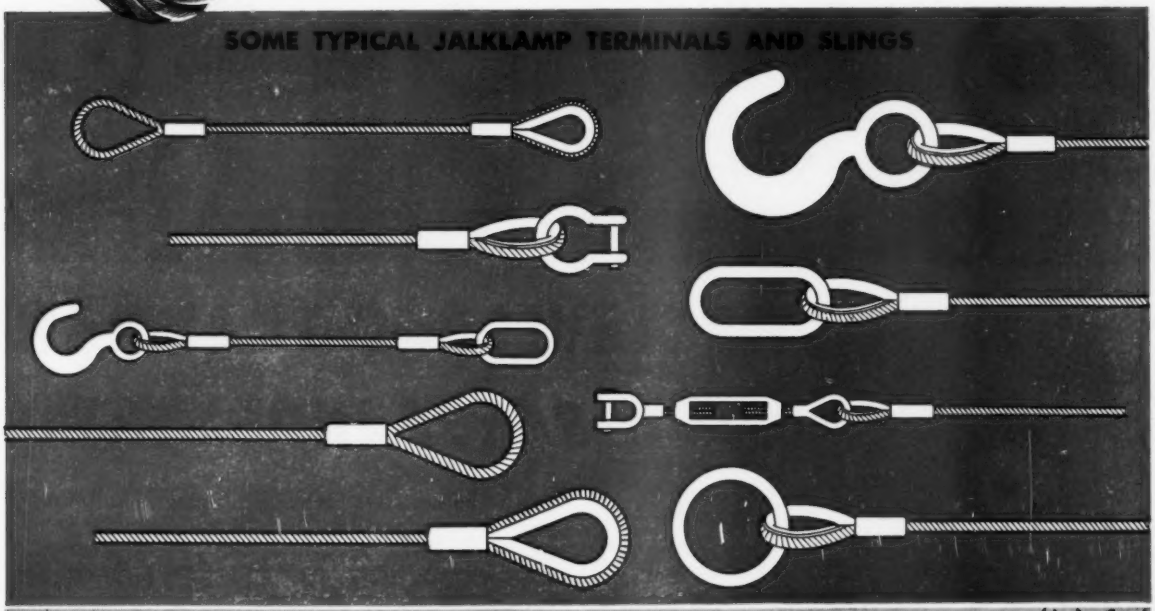
For more facts circle 508 on Reply Card

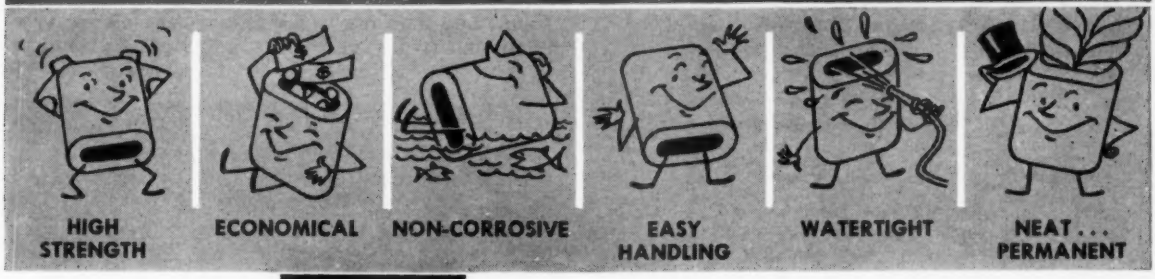
END YOUR SPLICING PROBLEMS WITH J&L JalKlamp SLINGS AND TERMINALS

Now, thanks to JalKlamps, you can order J&L Wire Rope with terminal splices which afford unsurpassed strength, corrosion resistance, safety and ease of handling. *And JalKlamp Terminals cost far less than you would spend to do the job yourself with conventional tucked splices.*

J&L JalKlamps are new non-corrosive special alloy sleeves with tremendous strength and unique cold forming characteristics. When squeezed around wire rope by a special hydraulic press, the JalKlamp metal "flows" into the spaces between the wires in the strands and the strands themselves, producing a neat, homogeneous splice as strong as the rope itself.

Take advantage of the extra economy . . . long service life offered by J&L JalKlamps. You can get J&L Wire Rope Terminals and Slings spliced with JalKlamps in all standard constructions, and in diameters from ⅛″ to 2″ with these centers—SpringKore, Plasti-Kore, Fibre Core and IWRC.





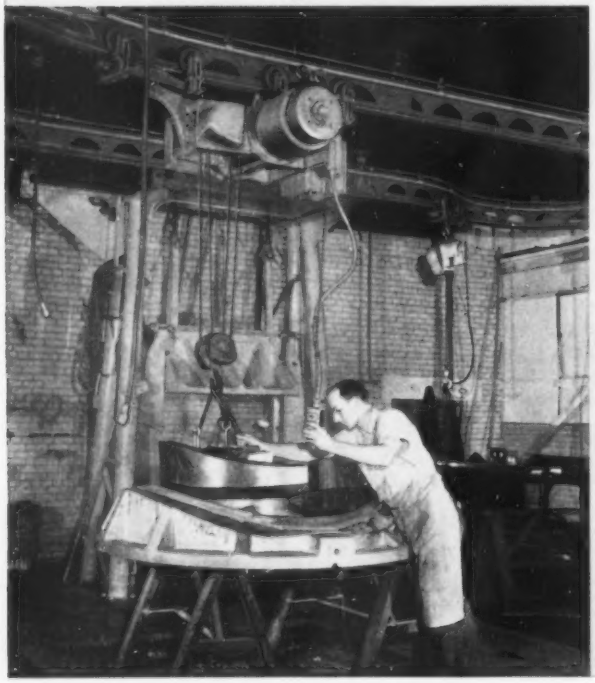
J&L STEEL

Jones & Laughlin
STEEL CORPORATION — *Pittsburgh*

For more facts circle 509 on Reply Card

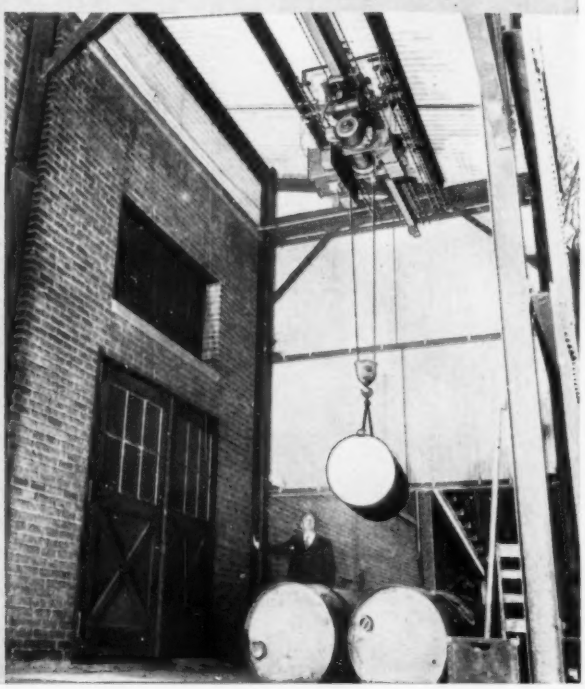
Cuts Die-Handling Time in ½

A large aircraft builder wrote: "Time and handling in this operation have been cut approximately in half by use of the Tramrail. In addition," operators report much greater safety and less danger of personal injury in handling heavy parts."



Automatic System Eliminates Three 10-ton Trucks

The need of three 10-ton trucks to haul materials between buildings was eliminated by a Cleveland Tramrail automatic dispatch system which does the job quickly without attendants accompanying. In addition, many man-hours of working time are saved daily and the load on an elevator is greatly reduced.



OVER 40,000 CLEVELAND TRAMRAIL *NOW SERVE* INDUSTRIAL

NOTE THIS: Regardless of size or type, MOST CLEVELAND TRAMRAIL INSTALLATIONS PAY FOR THEMSELVES WITHIN ONE YEAR—and they keep on paying handsome dividends year after year thereafter.

If you do not have an accurate cost record of all of your manufacturing operations, you may be astounded at the tremendous price you are paying to pick materials up, move and set them down. This may be your biggest expense item.

Illustrated here are a few actual case examples of the great savings and other important advantages

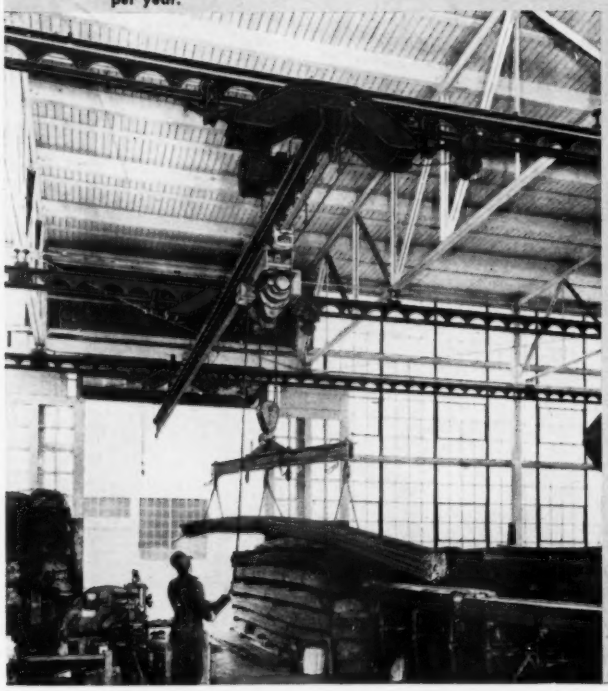
GET THIS BOOK!
BOOKLET No. 2008. Packed with valuable information. Profusely illustrated. Write for free copy

CLEVELAND TRAMRAIL DIVISION
THE CLEVELAND CRANE & ENGINEERING CO.
7564 East 284th St., Wickliffe, Ohio

CLEVELAND TRAMRAIL
OVERHEAD MATERIALS HANDLING EQUIPMENT

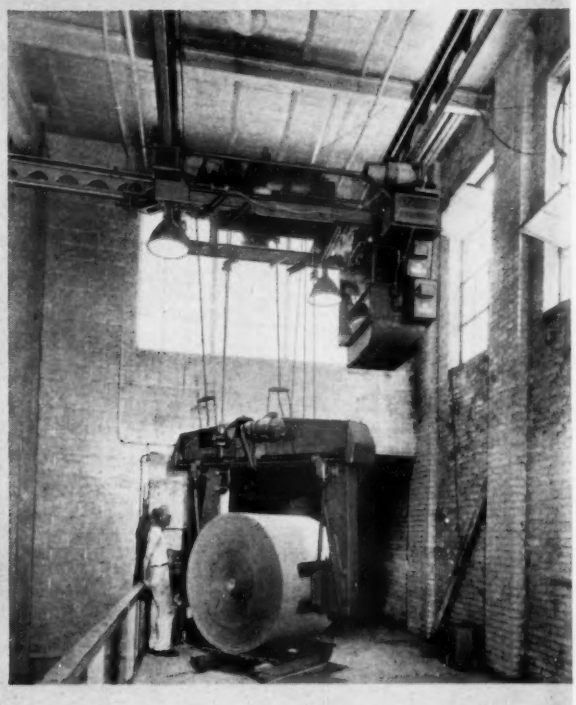
Saves $5,000 Yearly on Steel Cost

A West Coast manufacturer installed a completely motorized 5-ton Cleveland Tramrail transfer bridge that interlocks with an outside track over a railroad siding. Because this enables handling 5-ton bundles, a $2.00 per ton bundling charge is saved on steel purchased. Handling time is also saved. Since 200 tons are used monthly the total savings amount to $5,000 per year.



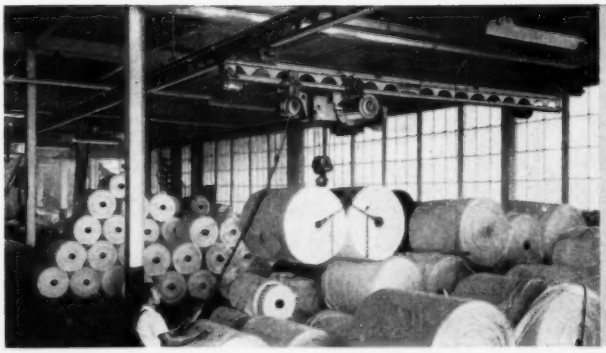
7,500 lbs. Paper Spoilage Saved Daily

Among other important cost-reducing advantages, this cab-operated crane with motorized roll grab in a large paper warehouse, cuts damage losses by 1% of total tonnage handled. Approximately 150 rolls weighing 750,000 lbs. are handled daily.



INSTALLATIONS AMERICA

Cleveland Tramrail has brought about in nearly every industry. Most likely you, too, have materials handling jobs in your plant from which big savings can be made. Why not have our engineers make a study and present recommendations, without obligation, of course?



Foundry Jumps from 3 Heats to 8 Daily

With no increase in man power, the installation of an inexpensive Cleveland Tramrail handpropelled system in a small brass foundry, made a terrific difference in their operations. It made possible 8 heats a day instead of 3, formerly usual. Despite more than double output, the men are less fatigued now at the end of a day.

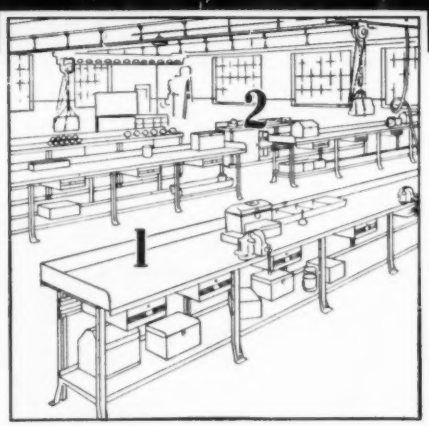
Increases Roll Storage Capacity 50%

The 400-lb. cloth rolls in foreground could only be piled two high until the Tramrail bridge was installed. Now one man can pile them three high easily. He can also deliver them to other parts of the building on the bridge and overhead track, directly without rehandling, thus cutting cost in this way, too.

For more facts circle 510 on Reply Card

MODERNIZING YOUR SHOP?
Fit it up FAST and at LOW COST
with standard HALLOWELL Shop Equipment

Whether you're fitting-up a repair shop or an entire plant, HALLOWELL Shop Equipment will save you time and money. And this interchangeable equipment gives you the benefit of adaptability—HALLOWELL benches, for instance, can be set up in continuous line or as individual units. For more information, consult your HALLOWELL distributor or write STANDARD PRESSED STEEL CO., Jenkintown 26, Pa.



1. Standard Work Benches
2 Standard Cabinet Benches

HALLOWELL® SHOP EQUIPMENT DIVISION SPS JENKINTOWN PENNSYLVANIA

For more facts circle 511 on Reply Card

AIRMAT PL-24

THE *Multi-Million* AIR FILTER

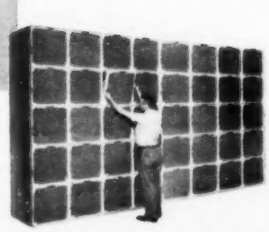
SINCE its introduction in 1936, over 225,000 units of this AAF dry filter, totaling one-quarter billion cfm capacity, have been installed.

All types of business use the PL-24 for all types of air cleaning service. The reasons—the highest cleaning efficiency of any commercial unit filter; simplified maintenance eliminating oil or water for washing.

The Type PL-24 is sturdy and compact—provides 28 sq. ft. of effective filtering area in a unit 2′ x 2′ x 8″. The efficient Airmat paper filtering media, being low in cost, is quickly replaced when soiled—cutting maintenance cost and returning filter to initial resistance and original condition. Unit construction simplifies installation for any capacity requirements.

Yes, in design, performance and acceptance, the Airmat PL-24 is definitely a multi-million*air* filter. For complete product information, call your nearest AAF representative or write for Bulletin No. 230.

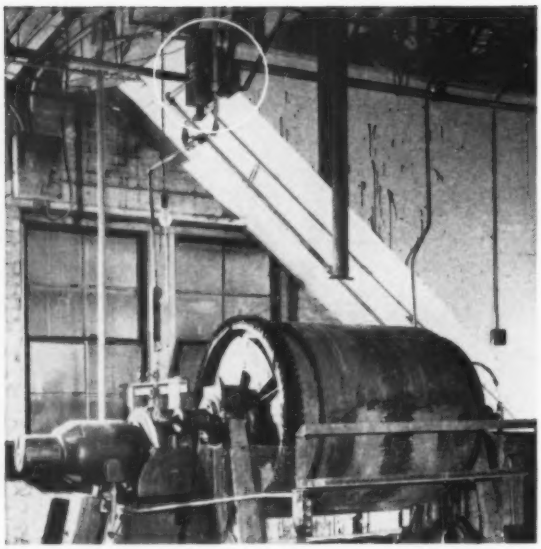
AAF



American Air Filter
COMPANY, INC.

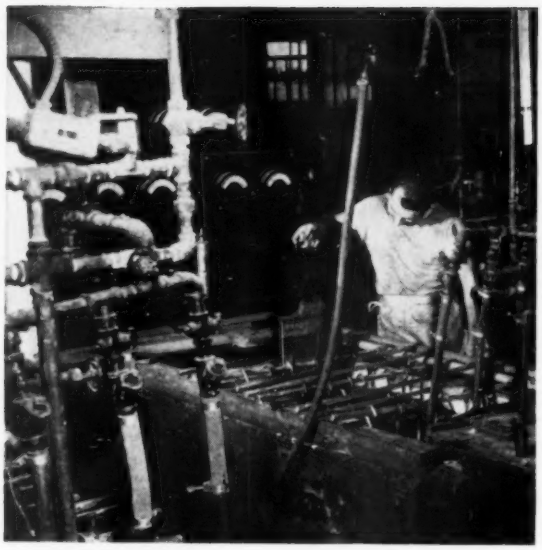
228 Central Avenue, Louisville 8, Kentucky
American Air Filter of Canada, Ltd., Montreal, P. Q.

For more facts circle 512 on Reply Card



Paint quality is improved *in the grinding phase now that Honeywell Temperature Controls are used at the Western Paint & Varnish Co., Duluth, Minn. These controls help maintain a constant temperature in a steel ball mill for grinding paint.*

Honeywell Controller Cost—$113.40*



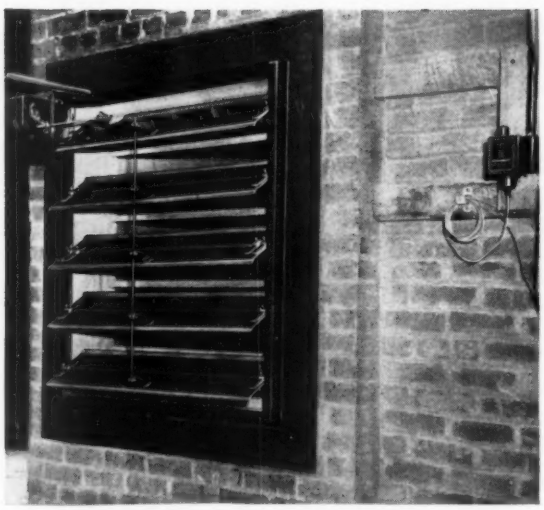
Temperature control of plating solutions *is maintained by Honeywell Remote Bulb Controllers at the Kingsboro Electrotype Corp., Brooklyn, N. Y. Now harmful temperature fluctuations are prevented and quality of electrotypes is improved.*

Honeywell Controller Cost—$29.00*

HONEYWELL INDUSTRIAL

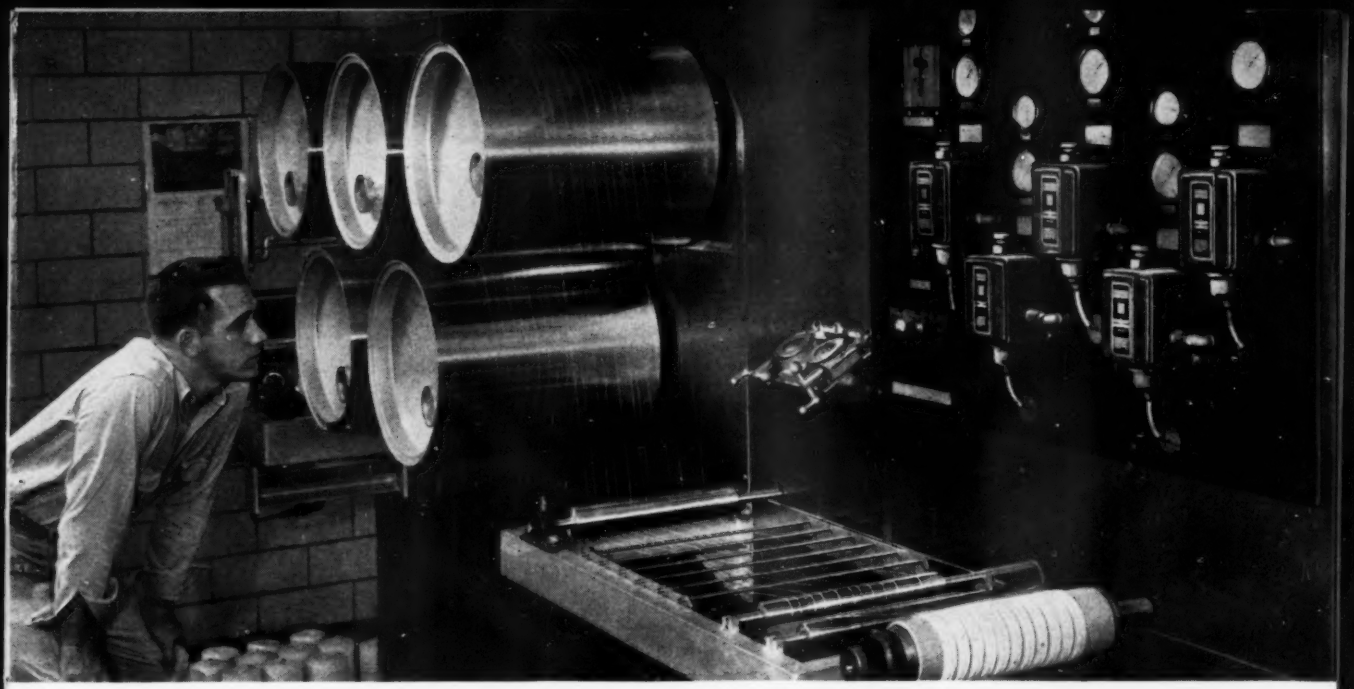
Atmospheric "conditioning" *of laminated wall panels at the Upson Company's Lockport, N. Y. plant is regulated by the Honeywell Controls pictured here. Higher quality embossing is attained when moisture content of panels is standardized through a controlled ventilating system.*

Honeywell Controller Cost—$266.40*



Better ware is the result *of controlled drier temperatures at the Jenkins Brick Co., Montgomery, Ala., thanks to installation of Honeywell Temperature Controllers and automatic louver dampers in the drier.*

Honeywell Controller Cost—$131.80*



Scientific drying of freshly sized yarns *in this Monsanto Chemical Company's experimental slasher is regulated by a Honeywell T415 Temperature Controller which insures proper drying speed to give highest quality yarn. Note individual controller for each drying drum on panel at right.*

Honeywell Controller Cost—$28.40* each

CONTROLS *Increase quality*

QUALITY of product can often be markedly increased by the application of a surprisingly simple improvement in plant operation at remarkably low cost.

For example, the unregulated drying speed of freshly-slashed yarns formerly resulted in a sizing-coating being either too soft or too brittle . . . affording little protection for yarn during weaving. An experimental slasher recently proved that, through the use of Honeywell Industrial Controls, drying speed could be so regulated as to insure consistently dried sizing, providing a stronger yarn and a better quality product.

Similarly, throughout the manufacturing world, versatile Honeywell Controls are called upon to increase product quality in hundreds of different ways.

Low-cost Honeywell Controls are uncomplicated in application and in construction . . . designed to perform a job effectively, inexpensively.

Throughout your plant there are many opportunities for Honeywell Controls to improve your product . . . as well as speed production, lower maintenance, reduce costs.

Your nearby Honeywell sales engineer will be glad to discuss how *you* can *increase quality* through the use of these controls. Call him today . . . he's as near as your phone.

MINNEAPOLIS-HONEYWELL REGULATOR CO., *Industrial Division*, Wayne and Windrim Avenues, Philadelphia 44, Pa.

Also manufacturers of a complete line of precision measuring, recording and controlling instruments.

MINNEAPOLIS **Honeywell**

First in Controls

**List price—subject to change without notice.*

For more facts circle 513 on Reply Card

You Can't Read This Ad Without Visualizing Tremendous Savings in Your Plant

If the handling of bulk materials is required in your plant, be they raw, finished, moist, liquid or rubbish materials, read these simple facts about the Dempster-Dumpster System. Then, visualize its application and tremendous savings possibilities in your own operation.

VISUALIZE HAVING ONLY ONE TRUCK with scores of bodies. One truck-mounted Dempster-Dumpster with only one man, the driver, serving many detachable Dempster-Dumpster Containers. These containers range from 2 to 21 cu. yds. capacity for use with recommended type Dempster-Dumpsters, and each container built to suit the materials to be handled—be they solids, liquids, dust, bulky, light or heavy. You place a container at convenient materials accumulation points, in or out of plant. As each is loaded, it is picked up, hauled and dumped, or the load is set down intact, and the entire operation is handled by hydraulic controls in cab by only one man, the driver.

The photographs above were made in the plant of one of the nation's leading brands of soaps and dentifrices. This installation comprises a single Dempster-Dumpster and 49 containers. Photos illustrate the simple one man pick up, hauling and dumping operation of a drop bottom container.

THE NATION'S LEADING FIRMS USE THIS SYSTEM BECAUSE OF ITS AMAZING EFFICIENCY AND TREMENDOUS SAVINGS.

YOU ELIMINATE trucks standing idle . . . eliminate re-handling of materials . . . eliminate loading crews. You increase efficiency, sanitation and good plant-keeping with this amazing Dempster-Dumpster System—the lowest cost method of bulk materials handling ever devised. Write us now for complete information. Manufactured and sold exclusively by Dempster Brothers, Inc.

One Truck-Mounted Dempster-Dumpster Handles Scores of Containers... All Designs... All Sizes

DEMPSTER BROTHERS, 194 SHEA BLDG., KNOXVILLE 17, TENNESSEE

For more facts circle 514 on Reply Card

For more facts circle 515 on Reply Card →

Balance is important in MOTOR STARTERS, too!

Only Square D Balanced Design Gives ALL the Features without sacrificing Any One!

EASY INSTALLATION. Plenty of wiring space with *no sacrifice of compactness.*

SIMPLE MAINTENANCE. Coils, contacts, interlocks, overload relays easily changed without disturbing external connections. Normal maintenance made still easier with standardized parts kits. No complicated identification, ordering or stocking.

FLEXIBILITY. A wide range of special requirements can be met in the field, using standard starters and parts kits available from local distributor stock.

THEY COST NO MORE . . . WHY SETTLE FOR LESS?

ASK YOUR ELECTRICAL DISTRIBUTOR FOR SQUARE D PRODUCTS

SQUARE D COMPANY

new

. . . and more efficient, too!

- Custom-designed for regular production!
- Built for a lifetime of service!

LELAND LOADSTAR MOTORS

Here are LELAND'S outstanding qualifications for producing the finest of motors to the new NEMA standards:

★ Extensive and continuing experience in developing and producing, for our Armed Forces, hundreds of thousands of *portable* generator units and *airborne* inverter units and controls. Leland designs consistently meet and frequently surpass specifications so satisfactorily that they virtually become the criteria for other suppliers.

★ More than 33 years' "creative electrical engineering" experience in supplying manufacturers with high-quality custom-built special motors, or standard LELAND motors adapted to the particular requirements of their products.

★ The combined, industry-wide engineering and development resources of American Machine & Foundry Company.

★ A unique combination of modern, mass-production facilities and custom craftsmanship, resulting in extra care in critical operations and greater versatility in production.

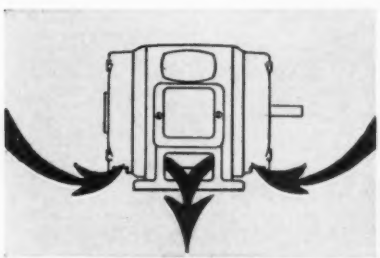
A completely new line of motors!

more power-packed . . . *higher in efficiency* . . . lighter in weight . . . smaller . . . better protected . . . quieter running . . . more efficiently cooled . . . more flexible . . . easier to install . . . modern in appearance . . . and maintenance-free!

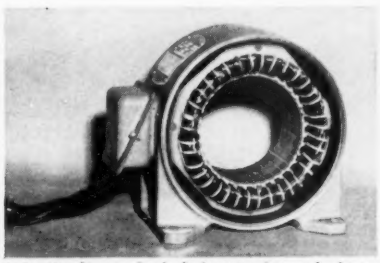
COMPARE this new polyphase, dripproof LELAND "*Loadstar*" motor point by point, feature by feature—the way we do at the factory—with all leading makes of motors! See if you, too, don't find it even further ahead of competition than previous LELAND motors, prior to rerating!

Users of LELAND motors have been enjoying outstanding performance, extra capacity and greater durability for a long time . . . perhaps unaware that these characteristics were often due to LELAND's advance use of improved electrical steels and high-dielectric insulating materials, which have *made possible* the new NEMA ratings!

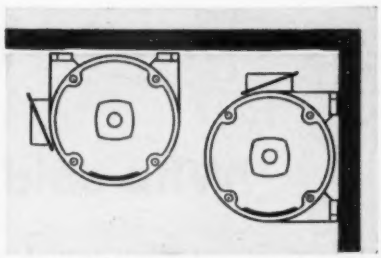
This completely new line of "*Loadstar*" motors carries over, with added refinements, many time-proved LELAND features. Others, entirely new, reflect LELAND's unique experience and creative engineering. Some of these are shown below. For the complete story and frame dimension details, *write for Bulletin No. 103.*



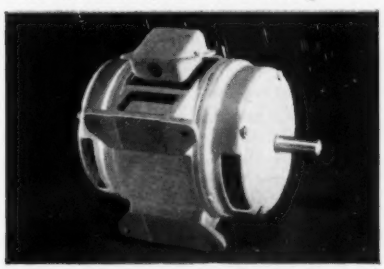
Cooling: (by convection) dual fans draw air in both ends, discharge through center vents; (by conduction) through partial stator-core-to-outer-shell contact, shown in cut at right.



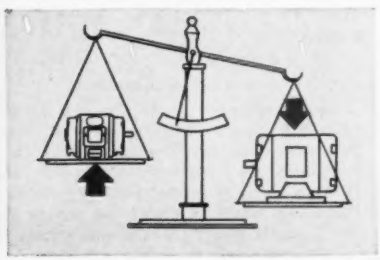
Leland's denser, high-dielectric slot and phase insulation takes less room, permits more copper in each slot, increases efficiency and aids heat transfer.



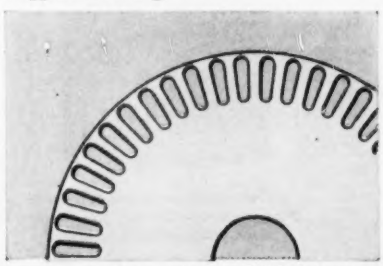
End shields have openings only in lower 70° . . . can be rotated for dripproof mounting on wall or ceiling. Drip cover provides for vertical dripproof mounting.



Rigid cast iron center and end frames (painted gray) assure accurate rotor alignment.



New motors take up to 40% less space; save as much as 33% in shipping weight.



Closed rotor slots and preloaded ball bearings eliminate whir and rattle heard in many motors.

New "Loadstar" polyphase, dripproof motors in 1, 1½ and 2 HP (180 frames) now ready. Totally enclosed and explosion-proof frames—also higher horsepower and single phase motors—available soon.

Another AMF Product

LELAND MOTORS

LELAND motors in previous NEMA standard frames will continue to be available for replacement and the convenience of present customers.

THE LELAND ELECTRIC COMPANY, DAYTON 1, OHIO, *Division of American Machine & Foundry Company*

For more facts circle 516 on Reply Card

"Who said people don't like Black?"

Pitt Chem coatings withstand years of exposure to a wide variety of atmospheric and chemical conditions.

DON'T get us wrong—we're all for pretty colors. Sky blue pink may be a smash hit on the walls of a bathroom or on a slick convertible sports car. But, if you're trying to save your plant and equipment from industrial corrosion, you'd better pick a protective coating with a work-horse color. A recent survey shows that plant maintenance people go along with us on that. They pick black as one of the two most popular industrial coating colors. Why?

It doesn't fade
It doesn't need cleaning
It "goes" with other colors
It creates no glare

And remember this: The black color of Pitt Chem Tar Base Coatings tells you they're made of one of the most impervious and durable of all protective materials—coal tar pitch. For long-lasting, economical protection against most mineral acids, alkalis, corrosive vapors and moisture, there's no finer protective material on the market today. ● If you have a corrosion problem, write or call a Pitt Chem Coating Specialist today. He'll gladly make recommendations . . . without cost or obligation.

PITT CHEM 101—For Severest Conditions
PITT CHEM 102—Maintenance Coating
PITT CHEM 103—General Purpose Coating
PITT CHEM 104—Potable Water Service
PITT CHEM 105 AQUATAR—A Water Dispersion
PITT CHEM 106 TARMASTIC—Sealing Mastic
PITT CHEM 107 PACHKOTE—Specialty Coating
PITT CHEM 110—Coating Sealer

PROTECTIVE COATINGS DIVISION
PITTSBURGH
COKE & CHEMICAL CO.
Grant Building • Pittsburgh 19, Pa.

WAD 5084

COAL CHEMICALS • AGRICULTURAL CHEMICALS • FINE CHEMICALS • PROTECTIVE COATINGS • PLASTICIZERS • ACTIVATED CARBON • COKE • CEMENT • PIG IRON

For more facts circle 517 on Reply Card

BULLETINS just released and of immediate plant interest

MATERIALS HANDLING

101 Lift Truck Work Kit—A method of predetermining the times necessary for fork lift trucks to perform specific operations is provided in this work kit, designed to enable plant engineers to apply fork lift truck standard performance date. It can assist in determining efficiency of fork lift trucks now in use as well as for planning for future needs. Includes typical materials handling examples to show technique for application of the data as well as charts providing times for basic truck motion elements. Also includes a quantity of work sheets. The Yale & Towne Mfg. Co.

102 Crawler Cranes—Catalog 87, 16 pp, describes the Powermatic Crawler Crane. Explains construction details of torque control unit incorporated, and its application to crawler cranes. Gives crane and shovel weights, dimensions. Orton Crane & Shovel Co.

103 Crawler Tractors—Manufacturer's complete line of diesel-powered crawler tractors is discussed pictorially in "Facts . . . on a New Breed of Tractors," 16 pp. Follows Time magazine's format to show operation, special advantages of crawlers. Tractor Div., Allis-Chalmers Mfg. Co.

104 Electric Hoists—Bulletin CQ pictures cable Quik-Lift electric hoists, from ¼ to 2 tons. Gives advantages, specifications, dimensions on lug, hook and trolley suspension. Coffing Hoist Co.

105 Light Conveyor Belts—Bulletin 2640 shows light conveyor belts for food handling (where temperatures range from 50 to 150 F.) or use where resistance to oils, mild acids, alkaline or neutral salts is important. Gives construction details of package conveyor belts, tells how to determine number of plies in a belt for a given service, gives splicing procedure. The B. F. Goodrich Co.

106 Gas Lift Trucks—Bulletin 5013, 8 pp, describes, illustrates the G52 series of 2000,-3000- and 4000-lb gasoline fork lift truck. Details inside and outside features; includes attachments which do a variety of the materials handling jobs. The Yale & Towne Mfg. Co.

MECHANICAL POWER TRANSMISSION

107 Improved Motor Pulleys—The complete redesign of this company's standard line of Vari-Speed motor pulleys is described in 28-pp Bulletin V-545. Replete with illustrations, some in full color, this booklet covers construction details, lubrication, controls available. Provides instructions on how to select proper unit, complete rating tables and dimensional diagrams. Also includes data on the Vari-Speed Jr. Reeves Pulley Co.

108 Motorized Reducers—For users of gear drives up through 75 hp rating, Bulletin 3100, 28 pp, offers selection tables, dimensions, weights, overhung load ratings and thrust capacity ratings needed to select company's horizontal, vertical or right angle Motoreducers. Bulletin's foldout section illustrates mounting positions, low speed shaft connections and product features. The Falk Corp.

109 Heavy-Duty Chain Drives—Catalog C 72-51 is a revised 16-pp profusely illustrated catalog offering new and expanded data on company's Hy-Vo high speed, heavy-duty chain drives. Operating principles and test data are provided for drives that will carry up to 190 hp per inch of chain width at continuous chain speeds up to 6000 fpm. Specifications and capacity curves are included for standard chain, and installation and lubrication recommendations are given. Morse Chain Co.

110 Bushings, Hubs—Of value to plant engineers interested in the design of industrial equipment is Technical Bulletin A-628A on Taper-Lock bushings, hubs, and adapters. Shows how one Taper-Lock bushing can be used in a variety of products. Interchangeability is also mentioned, not only among different products but also among different sizes and types of the same product. Other information, presented mainly in tabular form, includes data relating to bushing sizes. Also provided are cross section drawings, bushing numbers, bore sizes, prices. Dodge Mfg Corp.

111 Nylon Bearings—This 8-pp illustrated catalog describes standard lines of Nylined bearings and Nyliners. Describes advantages of this bearing material, particularly where bearings must operate without oil lubrication. Contains engineering data, installation information, bearing evaluation chart. Thomson Industries, Inc.

PUMPS, COMPRESSORS

112 Cradle Mounted Pumps—Bulletin 247 covers company's cradle mounted Compacunits. Includes construction features, sectional and external views, dimensions and material specifications. Warren Steam Pump Co., Inc.

113 Reciprocating Compressor—In addition to information on new Freon 22 units and duplex models, 32-pp Bulletin DS-361 has capacity tables, specifications and information on operating features for compressors and condensing units with capacities from 10 to 100 tons. Describes automatic multi-step capacity control, designed to meet widespread fluctuations in air conditioning loads, which is incorporated in all sizes. The Trane Co.

HEATERS, HEATING

114 Unit Heaters—Bulletin 7517, 48 pp, presents full information on latest design of this company's Venturafin unit heaters for steam or hot water applications. Gives features of construction, general engineering data, capacity tables. Fully illustrated with photos of horizontal and vertical models, dimensional drawings and piping diagrams, booklet includes tips on the use and selection of unit heaters. American Blower Corp.

115 Case Studies on Heaters—This brochure of engineering case studies includes nine bulletins, showing how company's Counterflo oil or gas fired warm air space heaters were used in diversified manufacturing plants. Industries include paint and glass work, mining, tool construction, radio assembly, granite polishing and inscribing. Dravo Corp.

116 Steam Heating Systems—Five major types of steam heating systems, with and without control, and a full line of valves, traps and steam power specialties are described in Bulletin 110, a 20-pp condensed catalog. Features company's Selectotherm system—automatically controlled high vacuum steam heating system that adjusts its heat output and fuel consumption to outdoor temperature conditions. Also describes a system for installations that are zoned, that use steam for purposes other than heating, and that use steam supplied by central station. Standard two-pipe vacuum and vapor systems are covered. Illinois Engineering Co., Div., American Air Filter Co., Inc.

ELECTRICAL

117 Shaded Pole Motors—Bulletin GEA-6134, 10 pp, describes shaded-pole fractional hp motors for fan and blower applications. Illustrates features and applications of motors with ratings from 1.5 w through 1/6 hp. Gives complete specifications, dimensions, operating characteristics. General Electric Co.

118 Two-Pole Induction Motor—Bulletin 05R8123, 8 pp, describes design of company's two-pole motors 900 hp and larger, for boiler feed pumps, pipeline pumps, centrifugal blowers. This bulletin features a discussion on how the auxiliary drive motor keeps pace with modern power. Diagrams include sectioned view of a typical large squirrel-cage induction motor and one showing how the machine is spirally ventilated. Allis-Chalmers Mfg. Co.

119 Storage Batteries for Trucks—Bulletin SB-2039-10-6-AF, 20 pp, revised, gives electrical data, weights, dimensions of all of company's battery assemblies. Explains, illustrates operation of nickel-iron-alkaline storage battery, its advantages. Edison Storage Battery Div., Thomas A. Edison, Inc.

120 Polarized Materials—Form 2785, 16 pp, catalogs polarized materials for any location requiring polarized connections. Receptacles, caps, connector bodies grounding type devices are listed. Pass & Seymour, Inc.

121 Cable Trays—This 12-pp catalog describes cable trays which offer a simplified method of supporting power and control cables. Presents straight run essential units, also those for horizontal and vertical runs, and miscellaneous fittings. Illustrated with installation photos, sketches of these strong but light weight supports, booklet includes load deflection data, tracing templates. Fab-Weld Corp.

122 For Process Industries — Electrical equipment for the process industries is presented in illustrated Publication GED-1966A, 28 pp. Provides detailed information on equipment for power generation, for power distribution and conversion, power utilization, and instrumentation. Also lists company publications of interest to process-industry plant engineers, and gives location of service shops. General Electric Co.

LIGHTING, COMMUNICATION

123 Standard Lighting Specifications—The 1954 printing of "RLM (Reflector and Lighting Equipment Mfrs.) Standard Specifications for Industrial Lighting Units" includes new data on "upward component" lighting units such as coefficient of utilization tables, luminaire distribution data and candlepower distribution curves, plotted at "normal," "parallel" and "45 deg." This 52-pp booklet also contains latest approved revisions for specifications. RLM Standards Institute, Inc.

124 Fluorescent Lighting—This 24-pp fluorescent lighting guide book is a reference digest on fluorescent products. Gives advantages of this type of lighting; summarizes various lamps and parts, including starter sockets, lampholders. Includes reference chart for lamp performance when interchanged with typical ballasts. Tabulations include seven shades of "white" lamps and 4 pp of ordering information. Sylvania Electric Products Inc.

On pages 215-216 are two postage-free Reader Service Cards provided for your convenience in ordering these bulletins. You may also use the cards to order any literature mentioned in ads.

125 For Emergency Lighting — Bulletin EL-181, describing company's self-contained Nicad emergency lighting unit, discusses automatic and instantaneous operation upon power failure, neon pilot lights showing readiness and high rate charge. Gives specifications. Nickel Cadmium Battery Corp.

126 Luminous-Tube Transformers—Bulletin GEA-5859C, 8 pp, describes company's complete line of luminous-tube transformers for indoor and outdoor application. Includes standard ratings, data and dimensions for brick-bat hanger, indoor hanger, core-and-coil, display sign transformers. General Electric Co.

127 Lamp Disposal Unit—Flur-O-Lamp disposal units for the safe and efficient disposal of fluorescent lamps are described and pictured in this 8-pp bulletin. Stresses ease of installation, small space requirement, other features. Also lists metal baskets and disposable bags for use with the units. Laduby Co., Inc.

128 Two-Way Radio—This 6-pp folder on mobile radio for industry details uses, describes, illustrates three models, accessories. Bendix Radio, Div., Bendix Aviation Corp.

DUST CONTROL, FILTERING

129 **Dust Collectors**—Bulletin D-53-30, 24 pp, describes Uni-Wash dust collectors, for foundries and industrial processing. Describes direct driven and vee belt units, includes data on cooling effect, evaporation and dust count, gives principles of industrial ventilation. Newcomb-Detroit Co.

130 **Automatic Filter**—Bulletin 248, 8 pp, describes company's Roll-O-Matic air filter with capacity ratings based on 500 fpm air velocities through media. Includes capacity tables, methods of maintenance, principles of air cleaning. American Air Filter Co., Inc.

Among Recently Published Literature of Merit . . .

131 **Hard-Facing Guidebook**—A recently revised 48-pp booklet, this guidebook is designed to aid in the selection and application of alloys producing greatest service life. Provides a quick source of information as to type and amount of hard-facing materials for a wide range of equipment in common use, and outlines and illustrates procedures. Not intended as a manual of welding fundamentals, this booklet is offered as a guide for those already acquainted with hard-facing. Although this details only manual hard-facing applications, it discusses briefly the automatic and semi-automatic electric methods. Stoody Co.

132 **Roller Chains, Sprockets**—Catalog 754, 64 pp, describes, illustrates a line of roller chain stock sprockets, including minimum bore sprockets for reboring, also finished bore and Taper-lock bushed sprockets which are ready to use. Tables show speed ratios for sprocket combinations, standard keyways and setscrews. Includes chain selection and application data, installation and lubrication recommendations, chain length calculations, dimensions and price lists for single and multiple strand roller chains, information on roller chain drive casings. Diamond Chain Co., Inc.

133 **Diesel Lubrication** — Newly revised and updated, the "Lubrication of Diesel Engines" (Bulletin B-1), is a 50-pp technical booklet written in easy-to-understand language and generously illustrated. It discusses diesel principles and design, types of engines in common use, operating cycles, engine accessories, and the choice of corrected diesel lubricants. A quick reference trouble-shooting chart lists remedies for faulty performance. Sun Oil Co.

134 **Polyester Film**—This 20-pp booklet titled, "New Developments in 'Mylar' Polyester Film," is the first of a series to be published on new applications for this product. Gives properties of Mylar, including physical, electrical, chemical and thermal. Discusses such products as sound recording tapes, electrical insulation, corrosion resistant drum liners. E. I. DuPont de Nemours & Co., Inc.

CONSTRUCTION AND MAINTENANCE

135 **Concrete Floors**—This 28-pp illustrated bulletin describes company's absorption process method of installation in step-by-step pictorial sequence. Gives advantages of heavy-duty concrete floor, examples of applications in warehouses, food and dairy plants, other industrial buildings. Kalman Floor Co.

136 **For Resurfacing Floors** — Technical Bulletin 38, 12 pp, describes DPS Masterplate, a metallic aggregate which combines with company's cement-dispersing agent and conductive binder to resurface badly worn concrete floors. Includes functional specifications, other advantages. The Master Builders Co.

137 **Aluminum Roof Decks** — Company's Reynodeck aluminum roof deck, a new industrial building product, is described in this bulletin. Describes product and uses, advantages, gives data and typical flashing details. Reynolds Metals Co.

138 **Protective Coatings**—Bulletin C-150, 8 pp, presents complete data on nine different protective coatings to help in selecting the one best suited for individual plant application. Discusses base formulation, temperature resistance, abrasion resistance, chemical properties, method of application. Includes properties chart; gives outstanding properties of six frequently used primers. The Ceilcote Co.

139 **Protective Coatings**—This 12-pp bulletin on company's materials and recommended coating treatments features DEL Primer P-9 as a general maintenance primer on wire brushed rusty metal or over old paints. Chemical resistance chart is offered as a guide for selecting proper coating system. David E. Long Corp.

140 **Synthetic Resin Coatings**—Eight synthetic resin coatings—Vinyl, Phenolic, Saran, Plastisol, Polyethylene, Epon, Neoprene and Silicone—are described briefly as to features and use in this 8-pp bulletin. Photos show application to storage tanks in various industries. Metalweld, Inc.

141 **Masonry Coatings**—Catalog page C110R contains color chips of the nine shades offered in this manufacturer's Arcopel, a rubberized masonry paint. Gives specifications, application directions for this paint, for a clear coating and a foundation coat. The Arco Co.

142 **Metal Pretreatments**—Three types of Vinsynite, a series of metal pretreatments or protective undercoats, are described in this bulletin. Includes application and use guide, shows typical applications. Specialty Coatings, Inc., Div., Thompson & Co.

143 **Industrial Ladders**—Catalog 54, 18 pp, describes and illustrates extension, straight, sectional ladders, light and heavy duty steps, platforms and scaffold planks. Gives specifications, explains Safe-Weight equipment, includes general information. Louisville Ladder Co.

WATER CONDITIONING

144 **Water Conditioning Gadgets**—This 8-pp technical paper, titled, "Practical Performance of Water Conditioning Gadgets," contains observations made this company's engineers on various devices used to prevent scale and corrosion in boilers, evaporators, heat exchangers and water piping. References are given describing such devices which have appeared since 1865. Hall Laboratories, Inc.

145 **Aids to Heat Transfer**—How film forming corrosion inhibitors also aid heat transfer is told in Technical Paper 129. Contains many references to protection afforded by filming amines and the attendant reduction in maintenance costs secured through protection against corrosion. W. H. & L. D. Betz.

146 **Primary Water Treatment**—The importance of eliminating high product rejection and damage to machinery from impure water is outlined in this 6-pp folder. Discusses value of primary treatment, and explains why such treatment should be approached only by experts. Hall Laboratories, Inc.

PIPING AND VALVES

147 **Insulated Pipe**—Catalog 35, 56 pp, presents data which will help plant engineers to design, order and install company's presealed insulated pipe systems. Includes system design and engineering data, installation and ordering instructions, and gives detailed field joint procedures. Tells why this pipe is qualified for conveyance of hot or cold liquids or gases in underground or overhead, weather-exposed conduit systems. Durant Insulated Pipe Co.

148 **Easy Working Valves**—Bulletin W8-A, 8 pp, describes company's Flowtrol valve, designed to replace valves requiring frequent or difficult manual opening and closing. Lists construction details, dimensions, technical data. Golden-Anderson Valve Specialty Co.

149 **Needle Control Valves**—Design and operating characteristics of needle type valves for applications requiring precise control of low rates of flow are explained in 8-pp Bulletin 5C-13. Includes table of nominal needle sizes with corresponding valve coefficients, and characteristic curve showing per cent of maximum flow in relation to per cent of total lift. Gives formulas and instructions for calculating size of control valve required. The Foxboro Co.

150 **Solenoid Valves**—Bulletin M-500, illustrated, gives design and performance characteristics of manufacturer's line of diaphragm operated solenoid valves, in six pipe sizes. Drawings show valve's two moving parts—solenoid plunger and synthetic rubber diaphragm—and give valve dimensions. Tables aid in selection of valves for various pressure ranges. Eclipse Fuel Engineering Co.

151 **O-Ring Butterfly Valves**—Stressing the outstanding features and many uses of company's Mudco O-ring butterfly valves, this booklet provides about 20 pp of data on types available. Accessories are pictured and price list included. Mud Products, Inc.

152 **Tips on Steel Valves**—Bulletin 542 gives technical tips on valve material, installation and usage, such as effect of heat on valve trim hardness, of thermal expansion on valve materials, others. Charts illustrate each "tip." Edward Valves, Inc.

153 **Flanged Check Valves**—Bulletin 654 pictures, explains features of company's flanged silent check valves for the control of water hammer. Includes a series of dimensional charts for valves of various sizes and pressure ratings. The Williams Gauge Co., Inc.

BOILERS, BURNERS

154 **Package Steam Generators**—Twelve-pp Bulletin PSG-1 describes company's Class VV steam generators, portable shop-assembled water tube boilers of simple and compact design and available in capacities from 10,000 to 30,000 lb of steam per hour. Gives design and construction details of the boilers, also capacities, dimensions, weights. Henry Vogt Machine Co.

Reader Service Cards for ordering bulletins are on pages 215-216. Be sure to include your name, job title, and company.

155 **Heavy-Oil Burner**—Features of this company's new Model 4 Hev-E-Oil burner are stressed in illustrated Bulletin AD-131. Fuel savings afforded, compactness and simplicity of design, starting ease, and other advantages are discussed. Cleaver-Brooks Co.

156 **Forced Draft Burners**—Catalog Unit Y, 6 pp, illustrated, describes forced draft packaged burners built to specifications for Scotch marine type boilers and other types of heat receivers designed for pressurized operation, for oil, gas or combination firing. Discusses construction and operation of these burners; includes ratings, sizes. Ray Oil Burner Co.

METALS

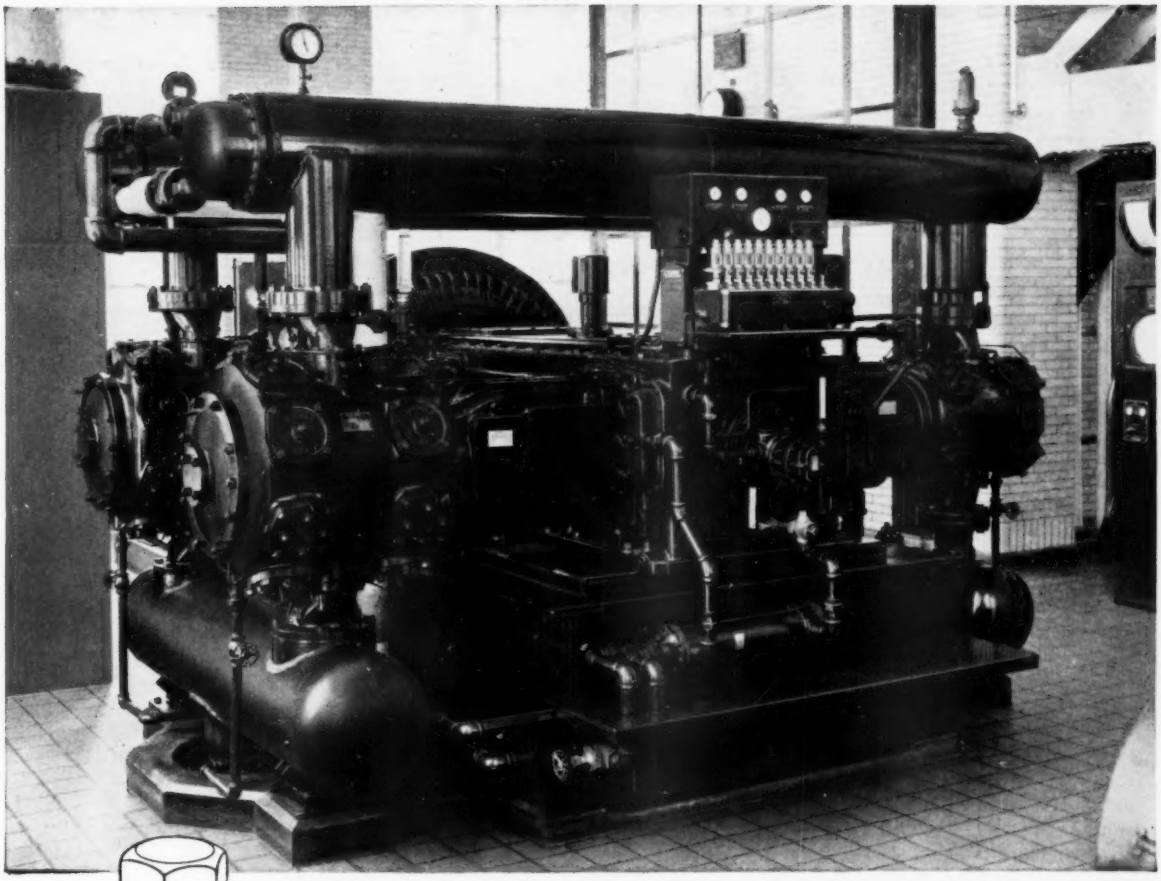
157 **Special Alloy Steel**—Bulletin AD-182, 8 pp, describes "Jalloy, Grade A," a special alloy steel for heavy duty use. Outlines properties, composition, applications, case histories, information on heat treatment of this steel. Jones & Laughlin Steel Corp.

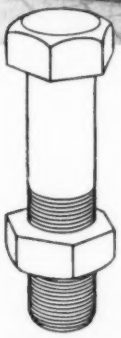
158 **Government Specifications Chart for Stainless**—This chart contains a complete list of government specifications for stainless steel fastenings. Includes latest specifications applying to U.S. Military, Army-Navy Aeronautical, Navy, Army and Federal production. Star Stainless Screw Co.

INSTRUMENTS AND CONTROLS

159 **Industrial Instruments**—Catalog 5001, 28 pp, is a revised edition of company's composite catalog on instruments for indicating, recording and control of variables. Describes and pictures pyrometers, potentiometers, thermometers, pressure gages, flow and liquid level meters, panelboards, diaphragm motors and motorized valve assemblies, switches and starters, other equipment. Industrial Div., Minneapolis-Honeywell Regulator Co.

(More Bulletins on page 217)





JUST BOLT IT TO THE FLOOR

that's all Ford had to do

Expanding operations at Ford Motor Company's assembly plant in Buffalo, N. Y. demanded additional shop air capacity. It had to be installed quickly and, if possible, without disruption to existing facilities.

Inasmuch as the installation was to be on the second floor of the power house, Ford engineers selected a Clark CMA-4, 350 horsepower, Balanced/Opposed Compressor. The low installation cost was an important factor.

With the Clark motor-driven unit, it was unnecessary to run foundations all the way down to the basement. Piping, which was beneath the proposed compressor location, did not have to be moved.

Because of the perfect balance of the Clark unit, it was possible to mount the motor and compressor on a steel sub-base which was bolted to floor I-beams. No foundations were required. No pipes were relocated.

. . . nor was there any lost production. The Clark unit was tied in over a weekend.

The Buffalo assembly plant is but one of many Clark Compressor installations serving the Ford Motor Company's vast operations.

Before you consider any proposed compressor location *impossible*, it may save you money to talk it over with your nearest Clark representative. In the meanwhile, make sure you have Bulletin 118 in your files. Write today.

CLARK BROS. CO. • OLEAN, N. Y.

Division of Dresser Operations, Inc.

Sales Offices in Principal Cities Throughout the World

PRECISION BY THE TON **CLARK** **balanced/opposed compressors**

150-4500 HP

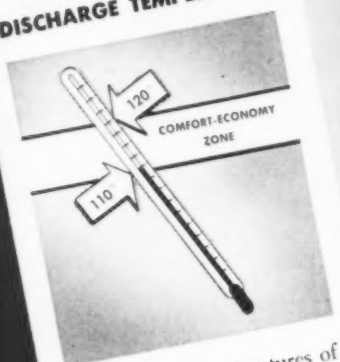
For more facts circle 518 on Reply Card

Before you buy any unit heater

Compare

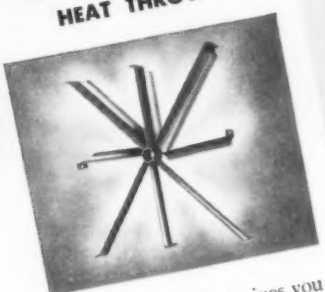
MODINE STEAM and HOT WATER units that top the field

Compare
DISCHARGE TEMPERATURES



Discharge air temperatures of 110° to 120° F. are correctly related to air velocities — the key to perfect heating comfort plus lower fuel costs.

Compare
HEAT THROW



No one but Modine gives you a built-in velocity generator that effectively steps up heat throw, assures positive heat penetration of cold air strata near floor.

In addition to horizontal delivery models, Modine offers a new line of vertical units for both steam and hot water. New, improved design is lighter, smaller, yet gives you *greater* capacity.

Compare LONG LIFE

Modine's advanced engineering is combined with superb styling and highest grade materials. Your assurance of long years of trouble-free service. *But see for yourself!* Call the Modine representative listed in your phone book, or write for Bulletin SE-54 on Modine Steam and Hot Water Unit Heaters.

Modine

...steam, hot water or gas...

Modine WITH ALL OTHERS!

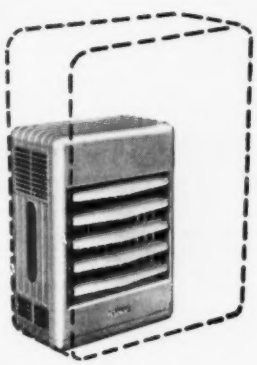
Modine Gas-Fired Unit Heaters are built in a full range of popular sizes. All are A.G.A.-approved for natural, mixed, manufactured, L.P. and L.P.-air gases.

GAS-FIRED units that top the field... with *stainless steel* burners and choice of stainless or aluminized steel heat exchangers

Compare

EASE OF INSTALLATION

Advanced design makes Modines 50% lighter in weight—more compact than other makes. Installation is faster, easier. No hoists or lifting aids are needed. No special structural supports or ceiling reinforcements are required. This means lower labor and material costs. And shipping costs are lower too because you pay no freight on useless weight.



Compare

PERFORMANCE

EVEN HEATING | MODINE | CONVENTIONAL

Not only do Modine units resist corrosion—all tubes heat uniformly because they're individually fired. Burners have elongated ports with four times the free area of ordinary drilled ports for resistance to clogging. Remember: with Modines you are *sure* of getting full rated capacity.

U-1202

Compare ALL-AROUND VALUES

As the leader in the development and application of steam and hot water unit heaters for more than 25 years, Modine brings unequalled experience to gas unit heating problems. Now you get this famous balanced performance at low overall cost in gas-fired units. For facts, ask for Bulletin 654. Modine Mfg. Co., 1563 De Koven Avenue, Racine, Wisconsin.

UNIT HEATERS

For more facts circle 519 on Reply Card

SAVE

Maintenance AND Towel Costs WITH

Sani-Dri
ELECTRIC
HAND OR HAIR DRYERS
SAVES MAINTENANCE EXPENSES!
New No. 8 wall model with patented, faster-drying features!
ELIMINATES TOWEL EXPENSE . . . SAVES STORAGE SPACE
ELIMINATES TOWEL LITTER

Save valuable maintenance time and eliminate continuing towel expense. New high-speed Sani-Dri provides quick, automatic hand or hair drying service 24 hours a day year after year! Sani-Dri is a permanent solution to your washroom sanitation and drying problem . . . and SAVES UP TO 85% OF YOUR WASHROOM COSTS!

NEW FASTER-DRYING FEATURES!

- *New faster-drying heating element!*
- *New smaller, oval nozzle produces more concentrated stream of air!*
- *Instant starting push-button switch with automatic shut off!*

All Sani-Dri Electric Dryers are GUARANTEED, and have carried the Underwriter's Seal of Approval for over 18 years!

New Brochure!

Shows all Sani-Dri hand and hair dryer models with new high-speed drying features . . . plus installation pictures. Write today!

Manufacturers of Stools, Table Bases and Costumers for Restaurants and Soda Fountains.

Distributors in Principal Cities

THE CHICAGO HARDWARE FOUNDRY CO.

"Dependable Since 1897"

4694 Commonwealth Ave.

NORTH CHICAGO, ILLINOIS

For more facts circle 520 on Reply Card

BACKTALK about our past issues

Edited by R. L. Marinello

Submerged Combustion Burner

PLANT ENGINEERING:

"There was a very interesting article in the 'Plant Engineers' Digest' section of the July, 1954 issue of PLANT ENGINEERING, on the subject 'Submerged Gas Burner for Solution Heating.'

"I would appreciate receiving any additional information you may have on this subject." *William E. Clark, Industrial Engineering Department, U. S. Steel Corp., Duquesne Works, Duquesne, Pennsylvania.*

▶ We are taking the liberty of writing to Mr. Walter George See, President, Submerged Combustion Co. of America, Hammond, Indiana, the manufacturer of this equipment, and telling him of your interest in more information on this process.—*Editors.*

Seeks Info on New Building

PLANT ENGINEERING:

"We would appreciate it if you could give us the address of J. H Pomeroy and Company, of Los Angeles, California.

"We would like to contact them in regard to the type of building referred to in the article 'What's New in Buildings?' which appeared in the May, 1954 issue." *Jacob H. Press, Jr., Vice President, Jacob Press' Sons, Inc., Chicago.*

▶ Additional information about this type of building may be obtained from N. H. Roach, vice president, J. H. Pomeroy and Company, 301 Roosevelt Building, 727 West Seventh St., Los Angeles, California.—*Editors.*

Construction Briefs Booklet

PLANT ENGINEERING:

"Would you please send me tear sheets of the complete series of interesting articles on 'Strength of Materials' and the other subjects covered in the 'Construction Briefs?'

"I understand the series started in July, 1953 and much valuable information must be in the back copies." *George R. Wagner, Plant Engineer, Process Equip. Div., A. O. Smith Corp., Milwaukee 1, Wis.*

PLANT ENGINEERING:

"Would it be possible to receive tear sheets on your articles 'Construction Briefs?'

"I have noticed some of your latest articles and while reading the 'Backtalk' section, find that these articles started in July, 1953 and would appreciate receiving the complete set, if possible." *Peter L. Miller, Plant Engineer, Warren Tool Corp., Warren, Ohio.*

▶ Since the requests for tear sheets of this series of articles has depleted our stock, we plan to reproduce the six articles that have appeared over the last year, beginning with the July, 1953 issue. The reprints will be available soon for any readers who may wish to have the complete file. A nominal sum will be charged to cover printing costs. If anyone is interested, kindly indicate this on the postcard in this issue.—*Editors.*

Three February Articles

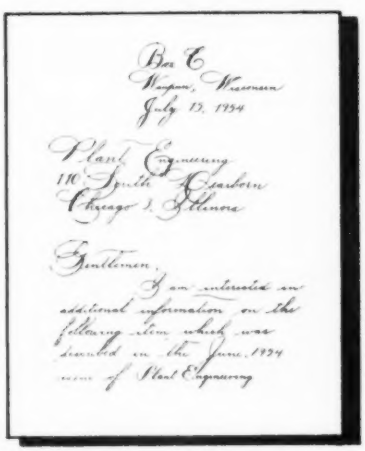
PLANT ENGINEERING:

"We would appreciate very much your sending us tear sheets from your February, 1954 issue, of the following articles: 'Gear Motors—Their Selection and Application,' 'Instituting Preventive Maintenance Systems Requires Good Spadework,' and 'Which Bearing for Which Service.'

"I felt that these articles were very interesting and quite worthwhile and I shall be looking forward to hearing from you at your convenience." *G. D. Drake, Engineering Department, The Norwich Pharmacal Co., Norwich, New York.*

Calligrapher Collins

▶ PLANT ENGINEERING recently received a request from Mr. Kendall Collins, Box C, Waupun, Wisconsin, asking for more



Box C
Waupun, Wisconsin
July 13, 1954

Plant Engineering
110 South Dearborn
Chicago 3, Illinois

Gentlemen:

I am interested in additional information on the following item which was described in the June, 1954 issue of Plant Engineering

information on a wiring template which was mentioned in the June, 1954 issue.

It is so seldom that we receive a letter written in such an even, neat hand, that a portion of his letter is reproduced here to show that the art of calligraphy is still being practiced.—*Editors.*

More Info on Lamp-Service Crane

PLANT ENGINEERING:

"The July issue of PLANT ENGINEERING usually comes to my desk weeks after its arrival and when it does it has usually been thumbed over by a half

BETZ • *A Great Name In Water Conditioning*

. . . meet "Mr. Outside"

■ Unusual title for a professional engineer? Perhaps so. Here's what we mean.

Actually, our activities are by no means limited to the regular chemical conditioning and control of boiler and cooling water. Take the Betz Consulting Division, for example.

Here is an entirely separate unit, staffed with chemical, mechanical and sanitary engineers, qualified through years of experience to make unbiased recommendations for the solution of problems involving the *external* conditioning of industrial and municipal water supplies . . . and for treatment and disposal of industrial wastes.

Many, if not most water or waste treatment problems are individual in character. They require study by *specialists* in order to reach a solution that is both operationally and economically sound. Such studies made by the staff of the Betz Consulting Division have saved much effort and productive time for hundreds of plants across industry. How can this important Division of Betz *completely-integrated* water conditioning service assist you?

W. H. & L. D. BETZ, Gillingham & Worth Streets, Philadelphia 24, Pa.

In Canada: BETZ Laboratories Limited, Montreal 1.

BETZ

CONSULTANTS ON INDUSTRIAL WATER PROBLEMS

For more facts circle 521 on Reply Card

GIVE ECONOMY A LIFT

There's one sure way to cut your load-handling costs. Use the 'Budgit' Electric Hoist. A few cents worth of electricity keeps the 'Budgit' going all day.

The 'Budgit' Electric Hoist is fast. A slight pull on the control cord of the ¼-ton 'Budgit' lifts the full load a foot in less than two seconds with spur-geared efficiency.

The 'Budgit' is rugged, trouble-free, safe. All moving parts are heat-treated for extra strength. Anti-friction bearings contribute greatly to smooth operation and low power consumption. Separate automatic motor and load brakes are provided. The hooks won't fracture if the hoist is overloaded. Every provision is made to safeguard man, load, and hoist.

No installation costs. No accessories to buy. The 'Budgit' is a complete, portable hoist — comes ready to hang up, plug in and use. Capacities: 250 to 4,000 lbs. AC and DC models. Priced from $139. Ask your "Shaw-Box" Distributor for details or write for Bulletin 391.

A 'BUDGIT' I-BEAM TROLLEY makes any hoist more useful. Tough steel construction. Ball bearings in wheels. Capacities: 500 to 4000 lbs. Bulletin No. 390 sent on request.

MAXWELL MANNING MM&M MOORE INC. TRADE MARK

'Budgit'®

ELECTRIC HOISTS

MANNING, MAXWELL & MOORE, INC.
MUSKEGON, MICHIGAN

Builders of "Shaw-Box" and 'Load Lifter' Cranes, 'Budgit' and 'Load Lifter' Hoists and other lifting specialties. Makers of 'Ashcroft' Gauges, 'Hancock' Valves, 'Consolidated' Safety and Relief Valves, 'American' Industrial Instruments, and Aircraft Products.

For more facts circle 522 on Reply Card

BACKTALK

dozen or more members of our organization. Today is an exception because our purchasing agent, Mr. R. W. Boldt, called my attention to the article entitled 'Lamp Service from Cranes' appearing on page 68 of the 'Operation and Production' section.

"It will interest you to know that the crane as well as the 'hanging basket' you illustrated is one of many throughout the Grumman Aircraft Engineering Corp. plant on Long Island which was built and designed by the Industrial Crane & Hoist Corporation in close cooperation with Grumman's engineers and architects, Walker & Poor.

"These cranes are built specifically for the purpose of maintaining the overhead lighting system and thus do not serve a dual purpose as in so many other plants where heavy capacity overhead cranes are tied up servicing light fixtures when they are more urgently needed in the production line.

"Too many companies are completely overlooking the economies provided with this type of lightweight service crane that can be shunted to one end of the runway when not in use, and we want to take this opportunity to thank you for focusing your readers' attention on another way to improve their plant engineering." *R. T. Gustafson, General Sales Manager, Industrial Crane and Hoist Corp., Chicago.*

Tear Sheet Request

PLANT ENGINEERING:

"In the January, 1954 issue of PLANT ENGINEERING appeared an article 'Cost Control Bonus from Centralized Maintenance' by F. O. Green.

"We are especially interested in this article and would appreciate very much receiving a copy if available." *F. M. Lowery, Auditor, Crane Co., Chattanooga Division, Chattanooga 1, Tennessee.*

▶ Tear sheets of this article are sent to you with the compliments of the editorial department.—*Editors.*

Suggestion on Grouting Problem

▶ In the Backtalk section of the July, 1954 issue, a letter from Harry A. Chris, 319 Druilhet Street, Jeanerette, Louisiana, was quoted:

"I am having trouble with cement grouting under bed plates on a gear train in a sugar mill. I would like to find out if there is a grouting that is stronger and will not shrink like cement grout or is there a way of strengthening a cement grout."—*Editors.*

Reader Offers Suggestion

One possible solution to his problem was offered by Robert B. Gilray. His letter to Mr. Chris reads as follows:

"You mentioned a grouting problem in a letter to PLANT ENGINEERING. Before and during the first part of this last war I was the steam turbine engineer for Westinghouse, and my grouting experience during this period has been of material assistance in my later work.

"There is a concrete additive on the market called Embeco which has a minimum of shrinkage and can be 'floated' under machines very readily. This additive is produced and sold by Master Builders Co., Cleveland, Ohio.

"I hope use of this material will prove as satisfactory for you as it has for us in the past." *Robert B. Gilray, Plant Engineer, Motor Products Corporation, Detroit, Michigan.*

Hot Strip Width Gage

PLANT ENGINEERING:

"Will you kindly tell me whether an article appeared in one of your issues this year on the hot strip width gage at the Gary Sheet and Tin Mill of United States Steel.

"We believe it was to have appeared about March of this year." *C. B. Zimmer, Industrial Gauges Corp., Englewood, New Jersey.*

▶ The article you are referring to appeared in the February, 1954 issue under the title "Pine Boards Verify Gage Accuracy." A tear sheet of this article is being sent to your attention.—*Editors.*

Reprints of NEMA Article

PLANT ENGINEERING:

"We noticed in the April issue, page 98, a very enlightening article entitled 'New NEMA Standard Motors—How Interchangeable?'

"In reading through this article, we find that most of the information contained therein would no doubt be of great value to our sales organization and we would like to know if reprints of the article are available for our use." *J. R. Perkins, Manager, Industrial Sales, Delco Products, Div. of General Motors Corp., Dayton, Ohio.*

▶ Reprints of this article are available at 15 cents per copy.—*Editors.*

Bearing Maintenance Article

PLANT ENGINEERING:

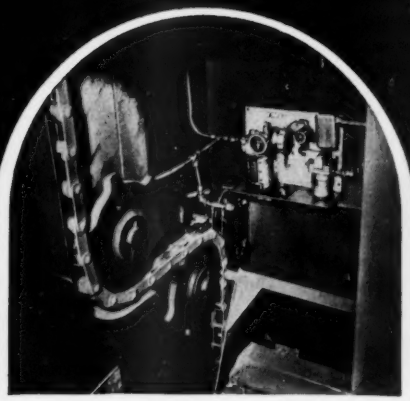
"In the January, 1954 issue of PLANT ENGINEERING an article appeared entitled 'Bearing Maintenance for Industrial Electric Motors.' The author was J. W. Samzelius of the Mechanical Engineering Division of the Westinghouse Electric Corp.

"The January issue had the second of two parts on motor bearing maintenance. I have been unable to locate the first section of this article and am requesting your assistance to obtain tear sheets of it." *Clarence P. Lefler, Maintenance Engineer, Lincoln Division, Elgin National Watch Co., Elgin, Illinois.*

▶ The first part of this article appeared in the December, 1953 issue, and tear sheets of this article are being sent to you with the compliments of the editorial department.—*Editors.*

For more facts circle 523 on Reply Card ——→

telling the story of 'dag' dispersions



Dry-Film Lubricants Resist Heat and Chemicals

Where conventional lubricants fail . . . on oven conveyors, bearings of kiln-car wheels, conveying equipment for hot strip steel or for degreasing tanks where most lubricants are destroyed . . . 'dag' Colloidal Graphite provides a durable, heat-proof, *dry lubricating film*. This remarkable film is unaffected by heat up to 750° F., and is fully effective under most conditions at much higher temperatures.

'dag' Colloidal Graphite is produced in a variety of liquid carriers . . . water, oils, volatile hydrocarbons, resin-solvent combinations . . . formulated for a wide range of industrial needs.

If your operations impose severe conditions upon the lubricants you are now using, send for helpful details of the remarkable 'dag' dispersions in Bulletins No. 425-J0 and No. 435-J0.

Dispersions of molybdenum disulfide are available in various carriers. We are also equipped to do custom dispersing of solids in a wide variety of vehicles.

Acheson Colloids Company

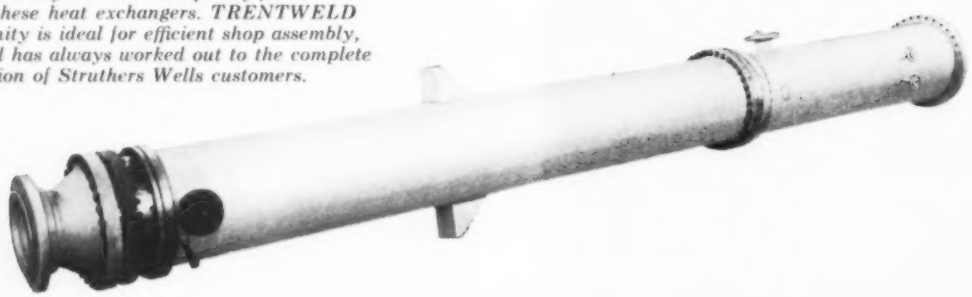
Port Huron, Michigan

...also ACHESON COLLOIDS LIMITED, LONDON, ENGLAND

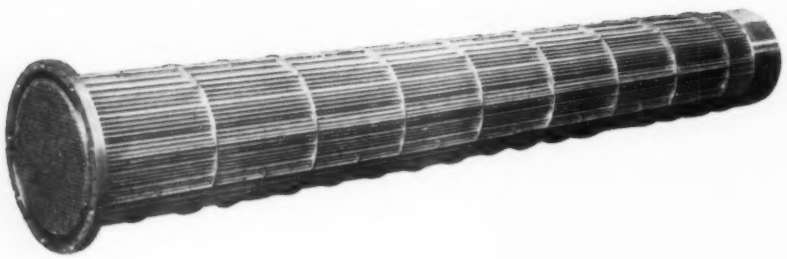
try 'dag' resin-bonded dry films for permanent lubrication

dag DISPERSIONS

Struthers Wells Corp. needed top dimensional accuracy and material quality for tubes for these heat exchangers. TRENTWELD uniformity is ideal for efficient shop assembly, and has always worked out to the complete satisfaction of Struthers Wells customers.



always uniform . . . extra quality . . . largest selection



TRENTWELD stainless tubing

It takes *specialists* to manufacture stainless welded tubing of uniformly high quality. That's why TRENTWELD is the *preferred standard* for quality wherever stainless or high alloy tubing is required.

For TRENTWELD stainless tubing is the product of tube mill specialists. The unique Trent process results in a *uniformly sound* weld indistinguishable from the parent metal – *and equal or superior to it in strength, ductility and corrosion resistance.*

Don't forget, too, that Trent offers you the widest size range found anywhere. ⅛″ to 40″ O.D. are standard sizes... and even larger diameters are available if you need them.

So, whether you need stainless tubing for heat exchangers or kiln dryers... fountain pens or frying pans – *for any requirement* for stainless or high alloy tubing – remember: *you can't buy better tubing than* TRENTWELD.

FREE – ask for your copy of the new book "Trentweld Stainless and High Alloy Tubing." You'll find practical details on applications, plus full tables on physical and chemical properties, and weights per foot on the sizes and grades you need. Send for your copy today.

TRENTWELD

STAINLESS STEEL TUBING

TRENT TUBE COMPANY, GENERAL SALES OFFICES, EAST TROY, WISCONSIN (Subsidiary of CRUCIBLE STEEL COMPANY OF AMERICA)

For more facts circle 524 on Reply Card

For more facts circle 525 on Reply Card →

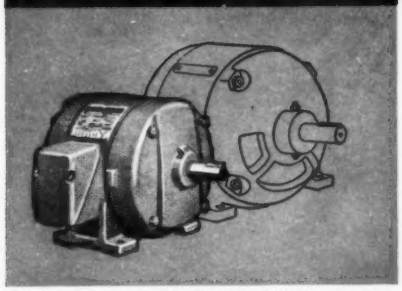
8 reasons why you should

MODERNIZE EQUIPMENT WITH TRI 55 CLAD MOTORS

REG. U.S. PAT. OFF.

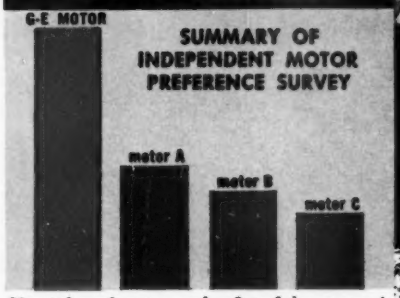
Plan now to modernize your equipment with the all-new General Electric Tri/Clad '55' motor, available now in many ratings; entire line of 1 to 30 hp a-c motors available soon. Contact your G-E Representative. General Electric Company, Section 648-6, Schenectady 5, N. Y.

MORE POWER PER POUND



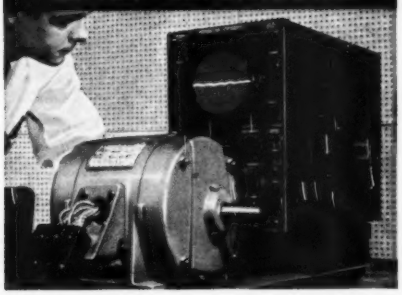
Lighter and smaller Tri/Clad '55' motors in new NEMA frame sizes and ratings save you space and weight, reduce handling costs.

BUYER PREFERENCE



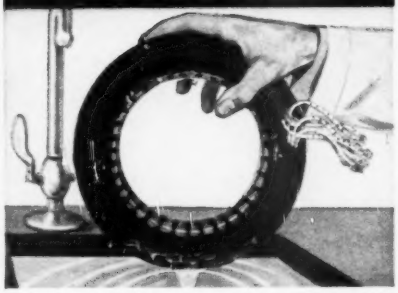
You take advantage of a 2 to 1 buyer preference for the electric motors on your equipment when you buy or specify a G-E motor.

BETTER PERFORMANCE



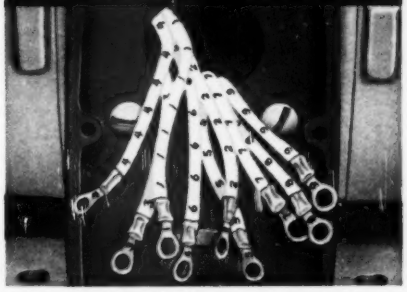
Quieter operation, proved by sound-room tests, is typical of the many performance improvements in the new G-E Tri/Clad '55'.

LONGER LIFE



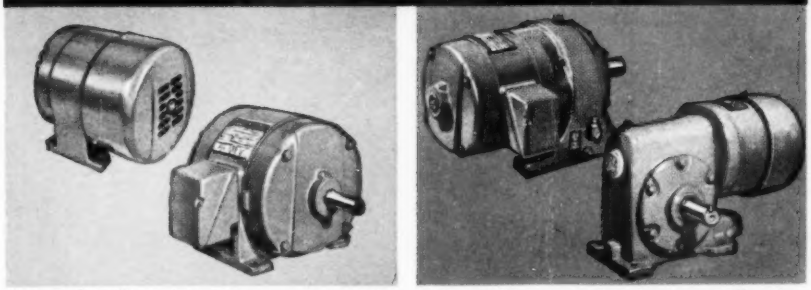
A silicone Dri-film* coating makes insulation shed water—lengthens motor life. Polyester-film insulation is 8 times stronger.

EASIER INSTALLATION



Perma-numbered leads are always instantly read even when wires are taped or clipped. Conduit box has plenty of knuckle room.

COMPLETE LINE OF NEW MOTORS



A complete line of new motors assures the right electrical drive for your machine. Write for Bulletin GEA-6013 on dripproof motors, GEA-6012, on enclosed motors. For low speed jobs, G.E. offers a complete line of gear-motors. Write for Bulletin GEA-6027.

NEAR-BY SERVICE

CLASSIFIED
Electric Repair Service
—(Continued)
GENERAL ELECTRIC
SMALL MOTOR SERVICE STATION
Complete facilities for in and out-of-warranty repair or exchange of A-C and D-C motors and generators to 15 HP. Authorized distributor G-E motor renewal parts and G-E single-phase motors.
"WHERE TO CALL"
AUTHORIZED G-E MOTOR SERVICE
Street Address..... Phone No.

G-E service is as close as your telephone. Authorized motor service stations provide repair-facilities in all major trading areas.

*Reg. trade-mark of General Electric Co.

Progress is our most important product

GENERAL ELECTRIC

REPLACE WITH G-E "889" H-F HEATING TUBES

....they're 4 ways better!

GL-889-A

GL-889R-A

1. **BETTER-PROVED . . . in thousands of heater installations, with many years' successful use to back up performance.**
2. **LONGER-LIVED. The braced, spring-mounted filament won't bow, greatly reducing "shorts" and tube failures.**
3. **STABLE ELECTRICAL PERFORMANCE . . . because the spring-mounted filament keeps filament-grid spacing constant at all times.**
4. **HIGH FREQUENCY. Up to 50 mc (GL-889-A) and 40 mc (GL-889R-A) at maximum input. Copper-to-glass seals throughout give top r-f efficiency.**

IF IT'S AN H-F HEATING TUBE, GENERAL ELECTRIC HAS IT!

18 POWER TUBES—ranging from 400 w plate dissipation to 100 kw—make up G.E.'s *complete* line of h-f and v-h-f oscillators for electronic heating. Your G-E tube distributor has the exact heater tube you need for any emergency replacement or for your protective plant inventory.

10 G-E RECTIFIER TUBES for electronic-heating applications, with avg current output 1.25 amp up to 12.5 amp—including 2 thyratrons for controlled rectification—are assurance that your power-supply tube needs will be accurately met.

BETTER TUBES mean lower operating costs. Ask your General Electric tube distributor for dollars-and-cents proof! Let him show you how the longer life of G-E tubes will pay off in fewer replacements . . . and in time saved, too—costly production time you WON'T lose from heater outages! Here's an economy that helps increase both your plant volume and profits.

Induction and dielectric heating are only as efficient as the tubes employed. Superior General Electric tube quality backs up both your workers and their output, keeps costs down. Get the full performance-plus-economy story from your G-E distributor . . . today! *Tube Department, General Electric Co., Schenectady 5, N. Y.*

GENERAL ELECTRIC

161-185

For more facts circle 526 on Reply Card

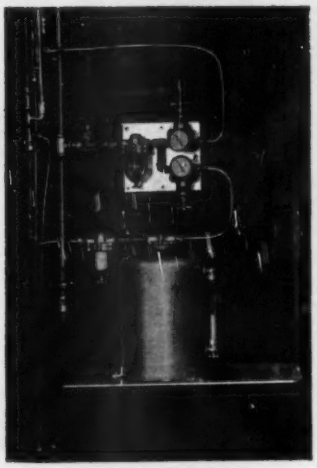
Norgren Spray-Lube System

DOUBLES OUTPUT OF VERTICAL TURRET LATHE at O. K. RUBBER, INC.

4 Spray-Lube lines give full spray coverage over 14¼" cutting edge of tool.

On roughing and finishing a straight ribbon tread on cast aluminum tire capping mold, Norgren Spray-Lube:

- stepped up surface cutting speed from 45 to 75 rpm.
- increased depth of cut.
- eliminated welding of chips on cutting tool.
- ended galling of work pieces.
- reduced tool maintenance.
- improved quality of work.

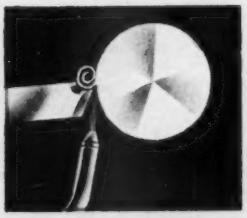


Spray-Lube control panel and liquid reservoir are centrally located for several machines.

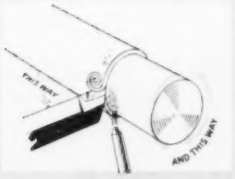
WRITE FOR COMPLETE DATA
NORGREN BLUEPRINT SL-2

C. A. Norgren CO.
3443 So. Elati, Englewood, Colo.

PIONEER AND LEADER IN OIL-FOG LUBRICATION FOR 26 YEARS



Coolant where you need it . . . spray is applied to work area from any required direction to thoroughly lubricate critical contact areas between cutting tool and work piece.



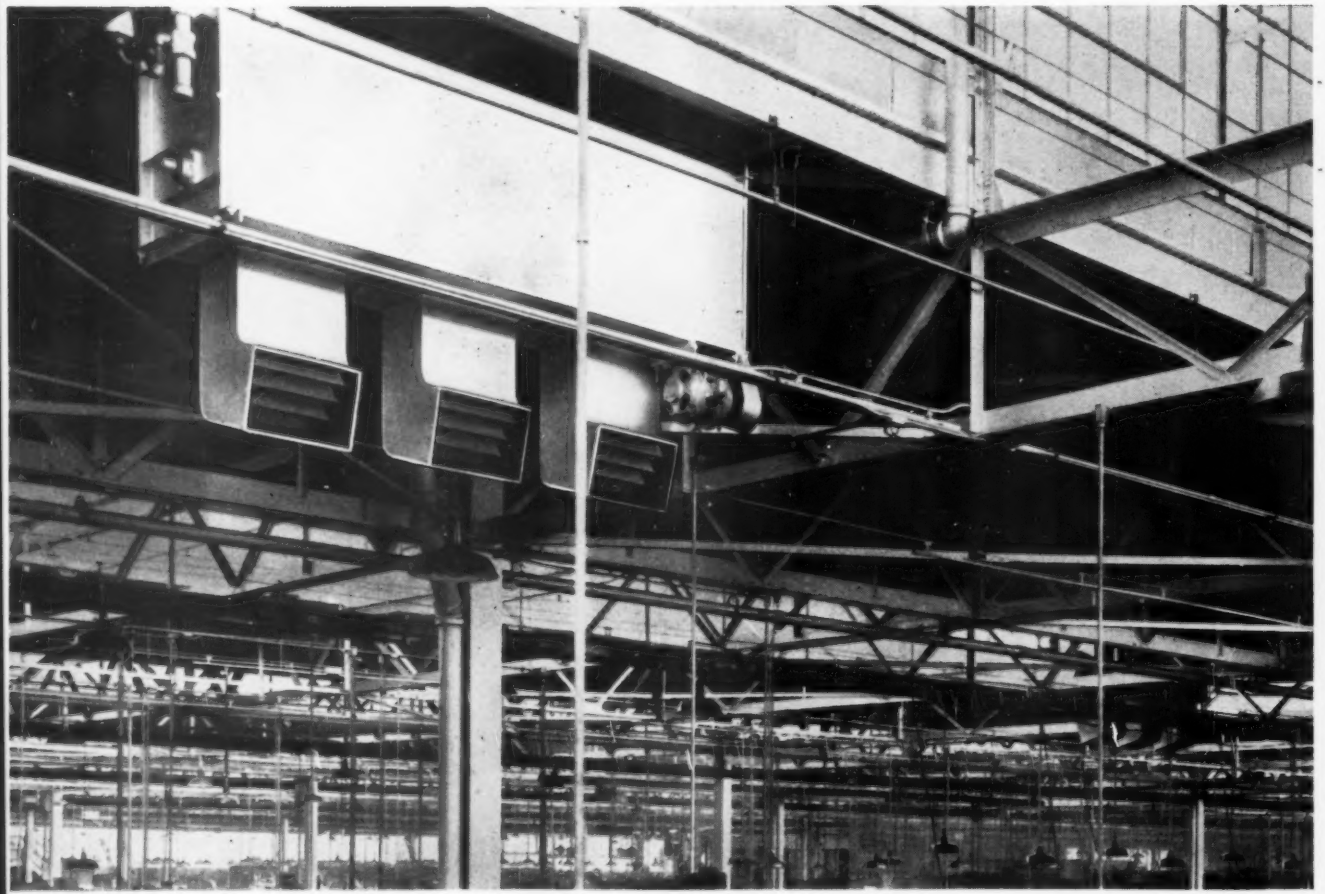
Step Up Production Speed. Rapid cooling at the cutting point will enable you to increase both the speed, and the feed of the cutting tool, and still improve workmanship and tool life. Notable increases in machine output have resulted.

VALVES FILTERS HOSE ASSEMBLIES REGULATORS LUBRICATORS

For more facts circle 527 on Reply Card

Here's why Trane Unit Heaters are in such demand:

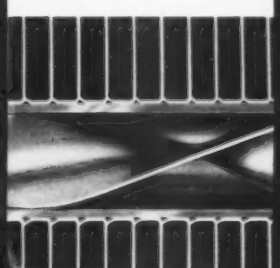
One unit can solve plant air cleaning or



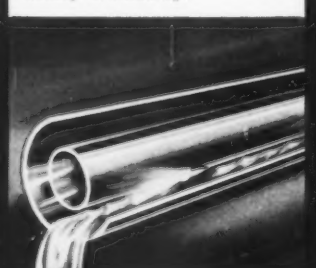
What the Torridor will do: The Torridor can be used to heat large areas where air must be spread over great distances, is equally suitable for heating numerous small rooms or a central system with ducts. It can be used as a combined heating and ventilating unit . . . for blanketing doorways with heat . . . for special process applications such as fog removal, ice melting, drying, curing, etc.

Typical users include: PRATT AND WHITNEY AIRCRAFT; WESTERN ELECTRIC CO.; CARBIDE AND CARBON CHEMICALS CO.; CATERPILLAR TRACTOR CO.; DEERE AND CO.; JOHNS-MANVILLE CORP.; KIMBERLY-CLARK CORP.; CORNING GLASS WORKS; INTERNATIONAL BUSINESS MACHINES CORP.

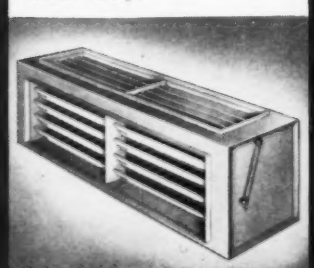
Turbulator in hot water coils assures maximum heat transfer from hot water to surface of coil tubes.

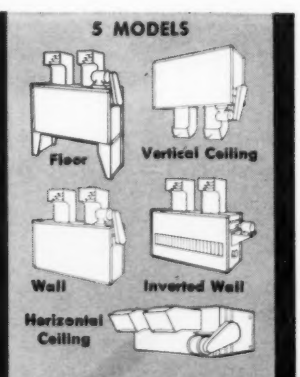


Kinetic orifice in steam coils releases steam in direction of condensate flow, speeds condensate drainage. Reduces possibility of freeze-up.

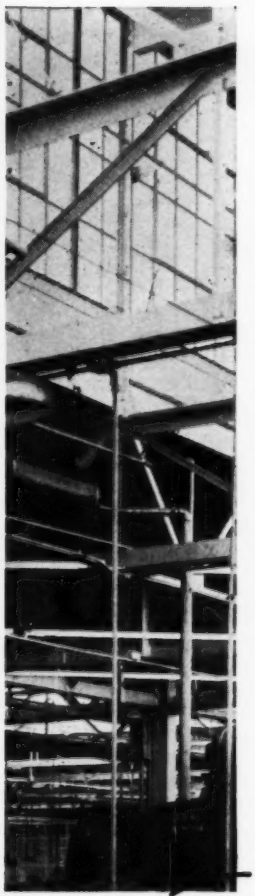


Mixing box blends re-circulated with outside air in any combination. Dampers may be operated manually or motorized. A standard accessory.





heating, ventilating, process-drying needs

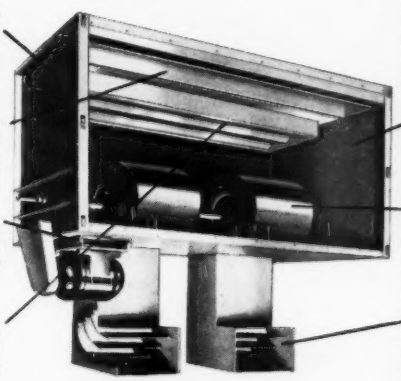


Use this Trane Torridor with or without ducts...in large areas or small...for comfort or process heating and ventilating needs.

One unit does the work of many! A single TRANE Torridor unit can produce as much heat as several propeller-type heaters—plus ventilation. Pipe, valve and fitting needs are less . . . installation and maintenance costs are lower. Capacities up to 1½ *million* Btu's.

Locate Torridors anywhere! Units can be hung from walls or girders, mounted on ceilings, or set on the floor. A wide choice of nozzle arrangements, top or bottom discharge lets you direct warmth in any desired direction.

For hundreds of applications. Heating, ventilating, air cleaning, process heating or drying . . . the amazingly versatile, high-capacity TRANE Torridor solves many of these problems. For complete information contact your engineer or nearest TRANE Sales Office, or write TRANE, La Crosse, Wisconsin.



Rugged casing of bonderized steel. Extra strong, rigid, *welded* construction.

Coil choice of high or low pressure steam, hot water, standard or "non-freeze" SD type.

Hinged motor mounting block for quick, easy adjustment of belt tension.

Damper choice in ventilating models. Face-and-by-pass (shown) or Thermadjust.

Filter choice of permanent or throwaway types, in flat or V-type frames.

Removable panel provides easy access to heart of unit. (Shown removed.)

Quiet fans dynamically and statically balanced on electronic equipment.

Directional vanes in the nozzles straighten air stream, eliminate turbulence.

one source • one responsibility

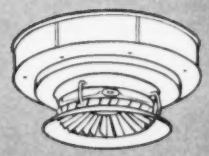
TRANE

Industrial Heating

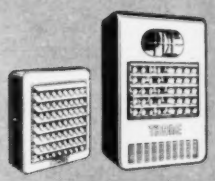
MANUFACTURING ENGINEERS OF AIR CONDITIONING, HEATING, VENTILATING AND HEAT TRANSFER EQUIPMENT

The Trane Company, La Crosse, Wis. • Eastern Mfg. Div., Scranton, Pa. • Trane Co. of Canada, Ltd., Toronto • 90 U. S. and 15 Canadian Offices

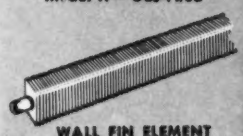
Quality products for all your heating and ventilating needs



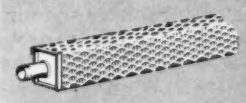
PROJECTION HEATER



HORIZONTAL HEATERS
Model H—Gas-Fired



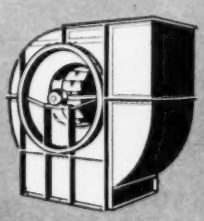
WALL FIN ELEMENT



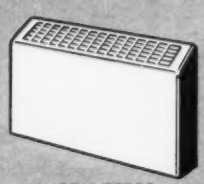
WALL FIN WITH GRILLE

STEAM SPECIALTIES

ROOF VENTILATOR



CENTRIFUGAL FAN



CONVECTOR

PLANT ENGINEERS' DIGEST so those who rush may read and know what's new

Edited by M. E. Weissman

Carbon Helps Measure Humidity

RELATIVE HUMIDITY can now be determined by measuring the resistance to an electric current of a film of carbon. The film consists of carbon powder in a water sensitive binding compound, which is then coated onto a strip of polystyrene plastic.

This new hygrometer overcomes the disadvantages of an earlier hygrometer made with human hair which is not sufficiently accurate for precision measurements. The time lag experienced with the lithium chloride hygrometer, now used in industry and research, has been almost eliminated.

When relative humidity is to be determined, a wire is attached to each end of the treated plastic strip. The free ends of the wires are attached to a measuring device, then an electric current is passed through the circuit. The resistance of the carbon film increases with the relative humidity by electronic, rather than by electrolytic conduction.

When humidity is low, the current passing through the carbon meets little resistance because the carbon particles are close together. When the air is moist, the binder absorbs water and the carbon particles are forced apart, increasing their resistance to the electric current. By measuring this resistance, an accurate reading of the relative humidity can be made.

The hygrometer, which is essentially independent of temperature from 0 - 104 F has been used in weather balloons to measure the humidity of the atmosphere. *From a release of Arthur D. Little, Inc., Cambridge, Massachusetts.*

Ingenious Pipe Packing

WITH MORE THAN 500 pieces of pipe and 450 pieces of conduit to be shipped to Bogota, Columbia, a problem in packaging was presented.

An ingenious solution was devised by William H. Baldridge, of the Engineering Purchasing Department. He put the smaller pipes inside the larger ones, which, in turn, were placed inside the largest pieces. Sweeping compound was blown inside each pipe to cushion the load. Then metal flanges were bolted to ends of the largest pipes.

Originator of idea shows how many different sizes of pipes were packed one inside the other for shipment to Bogota

About 20 pieces of 14-in. pipe, part

(Continued on page 40)

Electronic Scale and Truck Dump Form Successful Wheat Weighing Team

A NEW TRUCK DUMP and an electronic weighing device which automatically reads, records, and totals weights, are responsible for cutting in half the time required by previous methods to unload wheat from trucks.

Until the new equipment was installed at the Los Angeles plant, one system was used for both box cars and trucks. Wheat was unloaded with power shovels into two scale hoppers, each with a capacity of 5000 lb. Weights were transmitted to the dial of each scale and were then recorded electronically on a special graph.

The truck dump tilts the giant grain trucks on end, spilling the wheat from the back of the truck. However, this speed-up made it necessary to accelerate the method by which the grain moved through the scales to the bins.

Solution to the problem was the use of electronic devices. Separate unloading hoppers for trucks and boxcars were installed. Gates into the hoppers are controlled by air slides. The hoppers empty into a common conveyor traveling to a lofting leg which moves the wheat to two scale hoppers. These are equipped with air operated valves top and bottom.

Wheat flows into the scale hoppers until they contain approximately 4500 lb. Then an electronic shut-off device closes the inlet valve. After a brief pause to insure accuracy, the weight is read and recorded by an electronic device. This figure is put into an adding machine which totals the weight of the load from each truck or box car.

After weighing, the wheat is distributed to any one of the 11 house bins. *From The Modern Millwheel, published by General Mills, Inc., Minneapolis, Minnesota.*

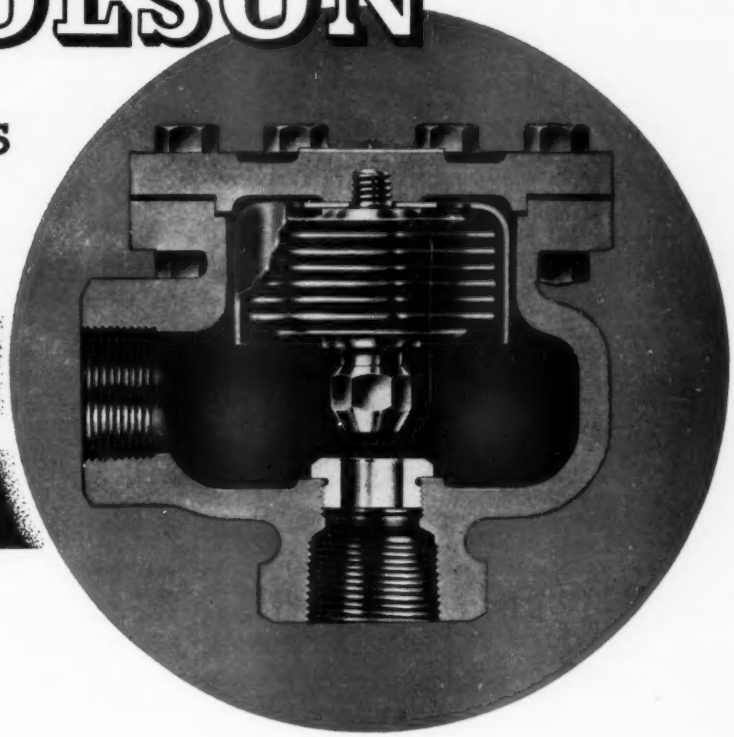
Giant truck is tilted to empty a load of wheat into an electronic weighing device

NICHOLSON

Steam Traps feature

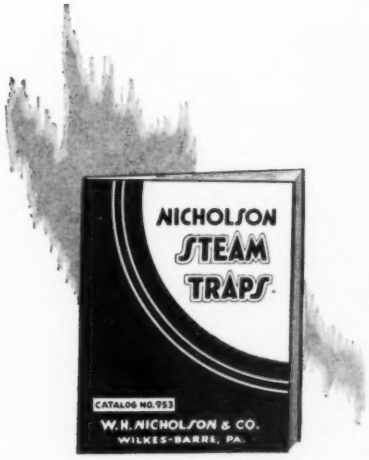
LESS parts

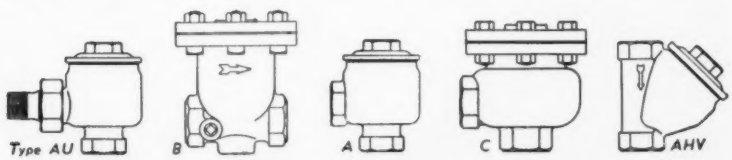
MORE capacity



Note the extreme simplicity of Nicholson industrial steam traps. The heavy-duty bellows integral with valve is the only moving part -- a substantial factor in their low maintenance cost. See also the larger valve orifice. This noteworthy feature results in Nicholson's 2 to 6 times average drainage capacity.

A recent survey showed the features following also to be reasons why plants with standardization-for-economy programs are increasingly adopting Nicholson traps: (1) Operate at lower temperature differential; fast action keeps equipment full of live steam; higher temperatures. (2) No air-binding; eliminate costly fluctuation of operating temperatures. (3) Freeze-proof; freely installed outdoors. (4) No need to change valves for varying operating pressures. (5) Record for low steam waste; as little as 1%.





FIVE TYPES FOR EVERY PROCESS, HEAT, POWER USE

Bronze, semi-steel or cast steel construction. All 5 types have stainless steel valves and seats; bronze, monel or stainless steel bellows. Sizes, ¼" to 2"; pressures from vacuum to 250 lbs.

SEND FOR TRAP CATALOG 953

This 32-page standard reference is complete with installation diagrams as well as charts and formulae for determining proper size of trap.

W. H. NICHOLSON & CO.

TRAPS · VALVES · FLOATS

208 OREGON ST., WILKES-BARRE, PA.

Sales and Engineering Offices in 58 Principal Cities

For more facts circle 529 on Reply Card

PLANT ENGINEERS' DIGEST

(Digest begins on page 38)

of the complete order, served as packing cases for the remainder. In this way, the cost of making shipping boxes was saved and risk of the loss of any of the smaller packing cases during the journey was eliminated. *From Circle-News, published by B. F. Goodrich Company, Akron, Ohio.*

Scaffold Hung from Building

HANGING A SCAFFOLD over the parapet of a building in need of repair, rather than building the scaffold up nine stories from the street, proved to be a satisfactory solution to one contractor's problem.

The problem was to remove and replace the brick on the parapet where mortar had disintegrated, causing the parapet to lean inward. Use of the special scaffolding allowed the replacement of 24,000 bricks in approximately five weeks and a saving of about $1500.

Hanging a scaffold over parapet proved simpler than building it up from street

The steel scaffold built for the job consisted of a tower, measuring 21 by 14 ft, with 22-ft outriggers cantilevered out over the parapet. From the outriggers were hung 30-in. wide ladder frames secured with toggle pins and spaced with pivoted cross braces. The frames, which extended 19 ft 6 in. downward, were planked for access.

Sides and back of the entire hanging portion of the scaffold were enclosed with chicken wire for safety and counter-balanced with 4000 lb of sandbags placed on the scaffold 15 ft back from the parapet.

The entire unit rolled on castors over boards laid on the roof. Built-in ladders provided access to working levels and pivoted cross braces increased the safety of the equipment.

Advantages of this type of scaffolding, according to the contractor, are; a saving of 90 per cent in the amount of equipment needed for the job; and the ability to move the scaffolding freely along the wall despite variations in the height of the parapet from three to 10 feet. *From a release of Waco Manufacturing Company, Minneapolis 16, Minnesota.*

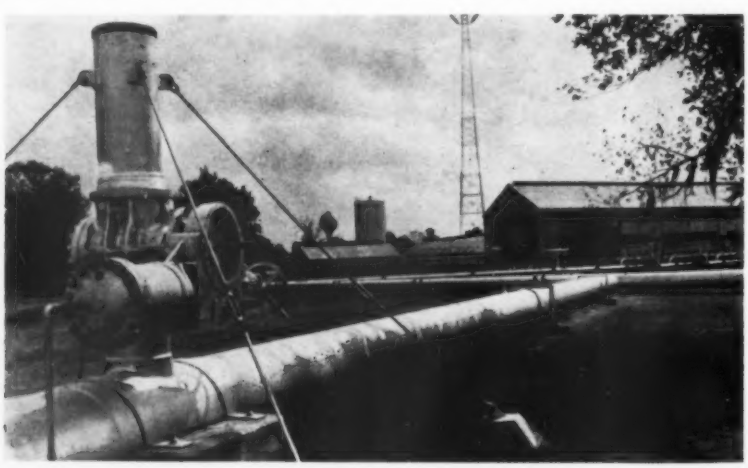
Safeguard Gas Lines with Good Valve Foundations

WITHOUT PROPERLY designed foundations, a gas line piping system can be seriously damaged by the "jet" action of blow-down valves.

When the valve is opened, the gas issues into the atmosphere at the velocity of sound. The result is a reaction in the blow-down system which causes it to move in a direction opposite to that of the gas.

To avoid severe damage to the system, resulting from this phenomenon, it is necessary to design and install for each blow-down valve a foundation that can withstand the reactive force. The maximum force exerted by the jet effect, rather than the average force for the entire blow-down period, should be taken into consideration.

The size of a blow-down branch is usually a fraction of the pipe line diameter, and is calculated to meet the necessary blow-down time, which may vary from one half-hour to a half-day. The shorter this period, the greater the jet action. *From a release of the Meter and Valve Div., Rockwell Mfg. Co., Pittsburgh, Pa.*



Steel struts reinforce blow-down valve foundation designed to withstand high velocity "jet" action of discharging gas in gas line piping system

Methods of Corrosion Control In Condensate Lines

SEVERE MAINTENANCE problems are created in steam and condensate return lines by corrosion caused by carbon dioxide.

Principal source for the presence of carbon dioxide in lines is bicarbonate and carbonate alkalinity of the boiler feed water.

Several methods of corrosion control are available and consist of external or internal treatment.

External treatments include the lime-soda and lime gypsum softening process, which reduces alkalinity to within the range of 50 to 60 ppm, principally in the carbonate form. With normal softener balances, carbon dioxide content of the steam will approximate 17 to 21 ppm when employing 100 per cent makeup water.

Use of lime-hot ion-exchange permits a further decrease in carbon dioxide by minimizing the carbonate alkalinity of the softener effluent.

A recent development in external treatment is alkalinity reduction by chloride-regenerated resins which exchange chloride for alkalinity in the softener effluent.

With proper selection of treatment processes, it is possible to reduce the carbon dioxide content of the steam to a minimum of approximately 5 ppm when using 100 per cent makeup water.

At this level, corrosion is not usually serious. However, at points of condensation and in condensing equipment where carbon dioxide can concentrate, serious corrosion may result. Where oxygen may be introduced into the condensate, through vacuum pumps or leakage, a corrosion problem can develop even when there is

HOW NEW SOLNUS OILS HELP MAKE AIR COMPRESSORS FIRE SAFE

Actual photographs show amounts of carbon residue left after dropping equal quantities of Solnus and two other oils on steel plates and baking in a closed oven at 500°F for 24 hours. The three oils all had viscosities of 300 SUS at 100°F.

SEE HOW CLEAN SOLNUS LEAVES HOT METAL

New SOLNUS Oil 0.9%

Typical Naphthenic Oil 5.5%

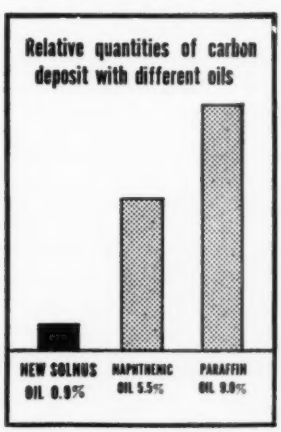
Typical Paraffinic Oil 9.0%

The biggest cause of air compressor fires or explosions is carbon formation on valves and in discharge lines. The best way to avoid these risks is to use the lubricating oil having the lowest tendency to form carbon.

New Solnus Oils have been proved ideal for air compressor use. The minute amounts of carbon that will form are of a fluffy nature; so they blow off quickly and do not build up. Thus the danger of fire or explosion is largely removed.

Solnus Oils have other important advantages, too. Your compressors need cleaning less frequently. This reduces maintenance costs. Shutdowns are less likely. Plant efficiency is increased.

Solnus Oils are also ideal for circulating systems, hydraulic systems, gear boxes, and general lubrication of your industrial equipment. They simplify your storage problems by doing with *one oil* many jobs that would otherwise require *several*. Combine their ability to protect metal parts against corrosion, their resistance to oxidation, and their moderate price and you see how Solnus Oils give you "more lubrication per dollar."



Let us send you our complete technical bulletin on Solnus Oils. Just write Dept. PY-9.

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Made by the refiners of famous Blue Sunoco Gasoline and Dynalube Motor Oils

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ALGRIP

The non-skid flooring that can't wear out!

Note depth and uniformity of abrasive grain.

Watch slipping accidents end and inflated insurance costs come down fast when you install ALGRIP Abrasive Rolled Steel Floor Plate wherever footing is treacherous.

ALGRIP gives sure protection against slips and falls, because each square foot of its tough, lightweight steel plate is impregnated with hundreds of tiny abrasive particles *to a controlled depth of penetration*, providing a rugged surface that *stays* non-slip—even on steep inclines! ALGRIP's "grinding-wheel" grain will never become smooth because hard wear only exposes new gripping particles . . . a safety bonus exclusive with ALGRIP.

Let ALGRIP stop slipping accidents in your plant once and for all. It will pay for itself in savings on insurance premiums. Mail this handy coupon today for full details without cost or obligation.

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PLANT ENGINEERS' DIGEST

(Digest begins on page 38)

adequate preparation of feed water.

Internal treatment measures include the use of alkalies and polyphosates fed to the stream in a water solution. Ammonia may also be used for corrosion control and iron pickup in central stations using low percentage makeup water, low carbon dioxide concentrations in the steam, and ferrous lines. Copper- and zinc- bearing metals suffer corrosion with this method.

Voltile amines provide another solution to the problem of corrosion by neutralizing the carbon dioxide. In low concentration they are not injurious to copper- and zinc-bearing metals.

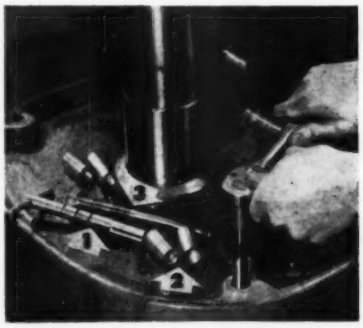
Disadvantages of this method are lack of protection against oxygen attack and relatively high treatment costs since quantity of the amine required is in direct proportion to the carbon dioxide content of the steam.

Filming amines function by forming an impervious film on the surface of the metal contacted, thus forming a barrier between metal line and condensate.

The film formed is of monomolecular thickness and does not increase with continued treatment. The amine penetrates old corrosion products on a metal surface and deposits its film on the metal itself. Protection against both oxygen and carbon dioxide attack is provided. *From the Betz Indicator, published by W. H. and L. B. Betz, Philadelphia 24, Pa.*

Machine Tool Leveling Method

PLANT ENGINEERS and maintenance superintendents can put to use a new method of leveling machine tools. In the cored holes of the base of the tool, stainless steel wire thread inserts are

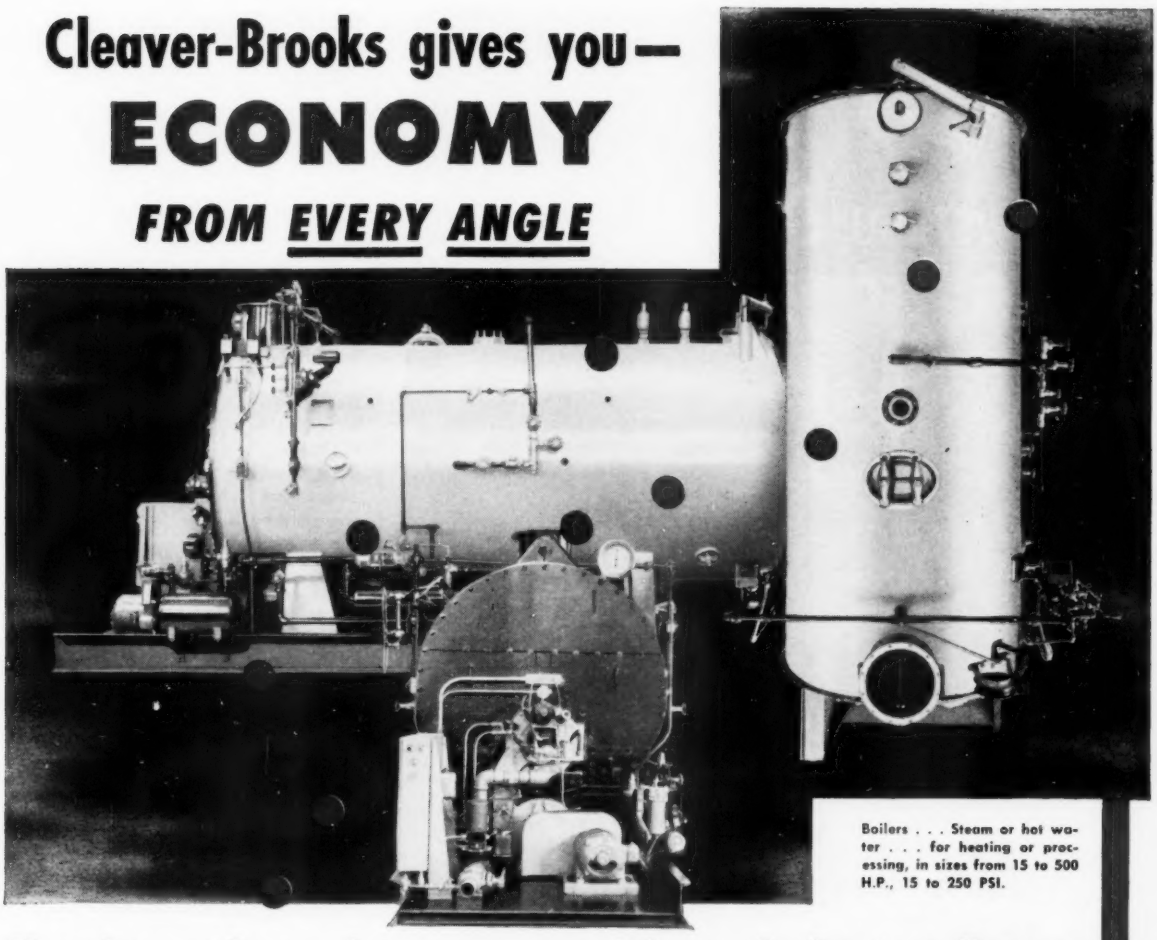


First, holes in the machine base are tapped; then items 1, 2, 3, insert tool, insert and bolt respectively are used

Cleaver-Brooks gives you—

ECONOMY

FROM EVERY ANGLE



Boilers . . . Steam or hot water . . . for heating or processing, in sizes from 15 to 500 H.P., 15 to 250 PSI.

Use this guide to plan present and future boiler installations

Here are basic reasons why Cleaver-Brooks self-contained boilers SAVE money wherever installed. Remember these advantages when expanding your present plant or replacing obsolete boilers. For complete details, write for catalog AD-100, Cleaver-Brooks Co., Dept. K, 306 E. Keefe Avenue, Milwaukee 12, Wisconsin, U.S.A. — *Cable address: CLEBRO — Milwaukee — all codes.*

● **SAVES FUEL** — greatest efficiency and fuel economy through high-heat transfer of four-pass, forced draft boiler design.

● **SAVES SPACE** — boilers are compactly self-contained. Use less boiler room area. Fit into low headroom locations.

● **SAVES SERVICE** — factory assembled with trouble-free, quality components. Tested and backed by Cleaver-Brooks' one-source responsibility. ASME code constructed.

● **SAVES MAINTENANCE** — oil, gas or combination oil/gas firing eliminates bulky fuel handling. Designed for easy cleaning and inspection.

● **SAVES EXPENSE OF SPECIAL EQUIPMENT** — boilers available for hot water or steam service . . . heating or processing applications.

● **SAVES INSTALLATION COSTS** — no special foundation needed. Set boiler on existing concrete floor. Simple, roof-high vent eliminates costly smoke stack. Service connections conveniently located.

● **SAVES THRU FUEL FLEXIBILITY** — uses most economical and available fuel in your area. Exclusive burner permits 10-second gas/oil interchange.

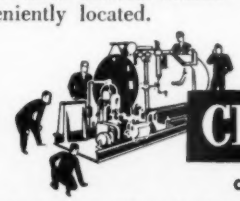
● **SAVES BY QUICK STEAMING** — meets fluctuating steam loads automatically. Electronic controls start and stop burner. Safety controls assure 100% protection.

● **SAVES MANPOWER** — fully automatic operation. All controls easily accessible and all normal maintenance can be done by men without special training.

● **SAVES PLANNING TIME** — standard design in 15 to 500 hp; 15 to 250 psi gives you custom planning for single or multiple units.

IT PAYS TO PLAN FROM *ALL* ANGLES TO GET GREATEST BOILER ECONOMY — PLAN WITH CLEAVER-BROOKS — WRITE FOR DATA TODAY

"It's NEW — get the facts on the CB boiler — write today!"



Cleaver Brooks

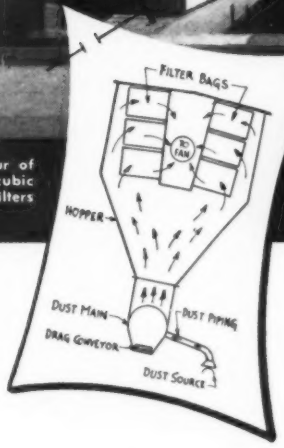
ORIGINATORS OF THE SELF-CONTAINED BOILER

For more facts circle 532 on Reply Card

SLY PIONEERS & LEADERS

INDUSTRIAL DUST CONTROL

Roof of automotive engine plant showing four of eight Sly Dust Filters cleaning a total of 400,000 cubic feet of air per minute. There are four identical filters on the opposite side of the roof.



DUST...

RECLAIMED—
RE-MELTED—
RE-USED

Here are four of the eight Sly Dust Filters which exhaust the dust from milling machines in a large automotive engine plant.

Dust from machining engine blocks and other operations, is exhausted into hoods over the machines, thence into mains and through the hoppers into the filters; the collected dust drops into hoppers thence into the mains and is re-claimed —briquetted, and re-melted.

Aside from the recovery of valuable materials, the use of Sly Dust Filters results in a clean plant and better working conditions.

Because of their larger filtering capacity and easy replacement of bags, Sly Dust Filters offer definite advantages in economy of operation and lower maintenance.

If you will tell us your dust problem we shall be glad to tell you what can be done about it and give you an estimate of cost.

THE W. W. SLY MANUFACTURING CO.

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PLANT ENGINEERS' DIGEST

(Digest begins on page 38)

installed to provide strong, non-corrosive, permanent threads for the bolts by which the machine is leveled. Shims are eliminated entirely.

The machine can be moved and releveled as many times as required by changes in production sequence, machine overhaul, or plant moves. The leveling bolts do not corrode and freeze in the holes because the stainless steel inserts protect against corrosion.

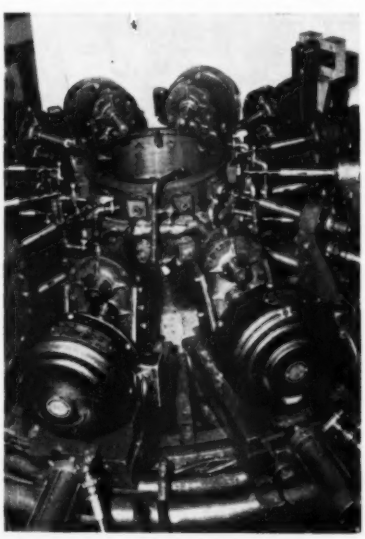
Drilling is unnecessary because the holes are cored during casting in dimensions commensurate with the size of the machine. The holes in the machine illustrated are of ¾ in. dia.

The first step is tapping the four cored holes with a Heli-Coil tap to accommodate inserts. Then the stainless steel insert, ¾-16NF, 1½ in. long, is installed. The bolts with the threads of the bottom half machined off are screwed in until the machine is level. A lock nut is tightened as the final step.

Wash water to clean floors, coolants or lubricants do not affect the insert. The leveling bolts can be turned without difficulty at any time after installation. *From a release of Heli-Coil Corp., Danbury, Conn.*

Wheel Driller Built in Shop

IN ORDER TO FULFILL an ordnance contract, the Nelsonville Foundry and Machine Company, Nelsonville, Ohio, built a wheel driller in three months,



Wheel driller, designed and built by company, gets power from 12 motors

"Yes, I agree... we should stick to coal," said the President.

PLANT ENGINEER: "On the basis of delivered BTU's any other fuel would cost us considerably more than coal."

PURCHASING AGENT: "Coal is the one fuel you can store in large quantities safely and economically. It always gives me a comfortable feeling to know there is at least a month's supply here in the bins."

SUPERINTENDENT: "Since we put in the new stoker and automatic ash removal we haven't had a bit of trouble with dust or smoke; and our boiler room labor cost is down to practically nothing."

SALES MANAGER: "One of our talking points is the uniform finish which comes from an even oven temperature. I hate to think what might happen if we changed to an on-again-off-again heat."

PRESIDENT: "There being no dissenting vote, we will stick to coal."

Bring your fuel problems to C & O

As the world's largest carrier of bituminous coal, the C&O is intimately familiar with every phase of coal use. We have a large staff of experts who will gladly help you to locate the coal best suited to your needs; to help you use it most efficiently; to help get it to you promptly.

Write to:
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Chesapeake and Ohio Railway
2111 Terminal Tower
Cleveland 1, Ohio

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FUEL OF THE FUTURE

Chesapeake and Ohio Railway

World's Largest Carrier of Bituminous Coal

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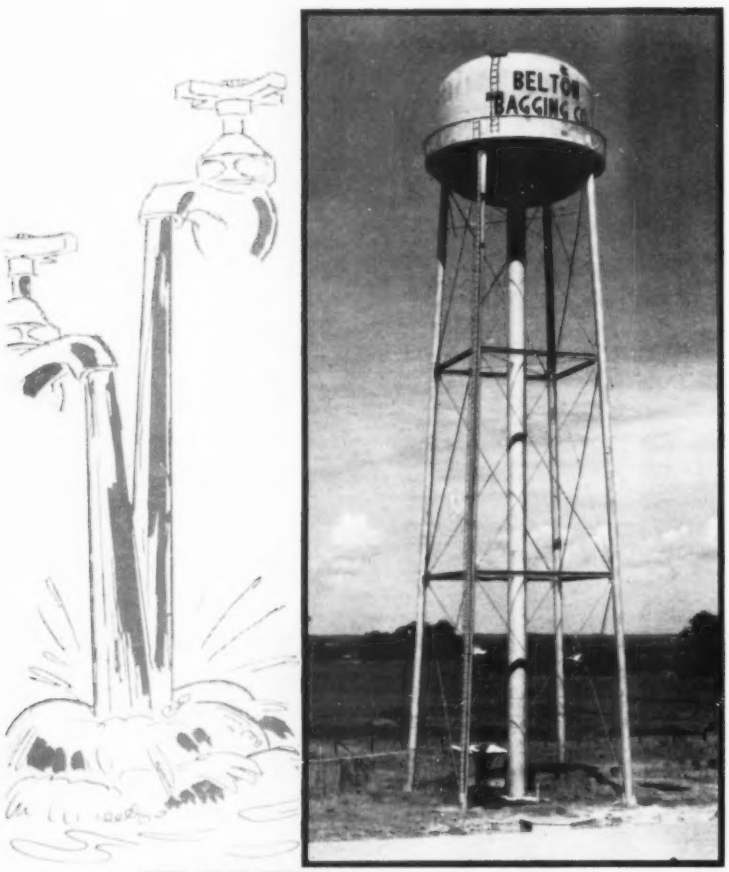
HORTON

ELEVATED TANK



meets DUAL water requirements

A 75,000 gallon ellipsoidal-bottom elevated tank was recently erected for the Belton Bagging Company, Belton, S. C. Providing a dependable water supply, the tank meets the company's dual water requirements for its automatic sprinkler system and general domestic needs.

Maintaining 60,000 gallons of water for fire protection and releasing the other 15,000 gallons for general water service, Belton Bagging Company is assured of a never failing, efficient water supply. At any hour of the day or night, water is ready to flow under constant, dependable gravity pressure.

Perhaps your plant may benefit from a Horton® elevated tank. Standard capacities range from 15,000 to 500,000 gallons. For information, estimates or quotations, please write our nearest office.

CHICAGO BRIDGE & IRON COMPANY

Atlanta 3	2148 Healey Building	Los Angeles 17	1574 General Petroleum Building
Birmingham 1	1555 North Fiftieth Street	New York 6	3317-165 Broadway Building
Boston 10	1067-201 Devonshire Street	Philadelphia 3	1649-1700 Walnut Street Building
Chicago 4	2134 McCormick Building	Pittsburgh 19	3243 Alcoa Building
Cleveland 15	2258 Midland Building	Salt Lake City 4	570 West 17th South Street
Detroit 26	1569 Lafayette Building	San Francisco 4	1582-200 Bush Street
Havana	402 Abreu Building	Seattle 1	1370 Henry Building
Houston 2	2166 C & I Life Building	Tulsa 3	1669 Hunt Building

Plants in BIRMINGHAM, CHICAGO, SALT LAKE CITY and GREENVILLE, PA.

PLANT ENGINEERS' DIGEST

(Digest begins on page 38)

instead of waiting the 12 months required for delivery of a new tool.

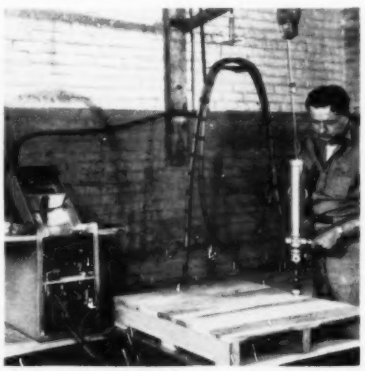
The driller, designed by the company's Mr. J. A. Williamson, will drill 24 holes simultaneously in the rim of a tank bogey wheel in preparation for riveting.

After partial assembly, the wheel is fed by roller gravity conveyor into the driller, which is powered by twelve 1-hp Fairbanks-Morse axial air gap electric motors.

Motors, gear boxes and drills are mounted on cast iron slides, hydraulically operated and electrically controlled. When the drilling is completed, limit switches shut off the motors and the operator trips a four-way hydraulic valve which backs out the drilling units. *From Fairbanks-Morse News, published by Fairbanks, Morse Company, Chicago, Illinois.*

Nail-Driving Time Cut in Half

A SINGLE STROKE of a portable pneumatic nail driver will sink a nail completely, enabling the operator to



Portable nail driver speeds operation in pallet-making. Feeding unit is seen, left

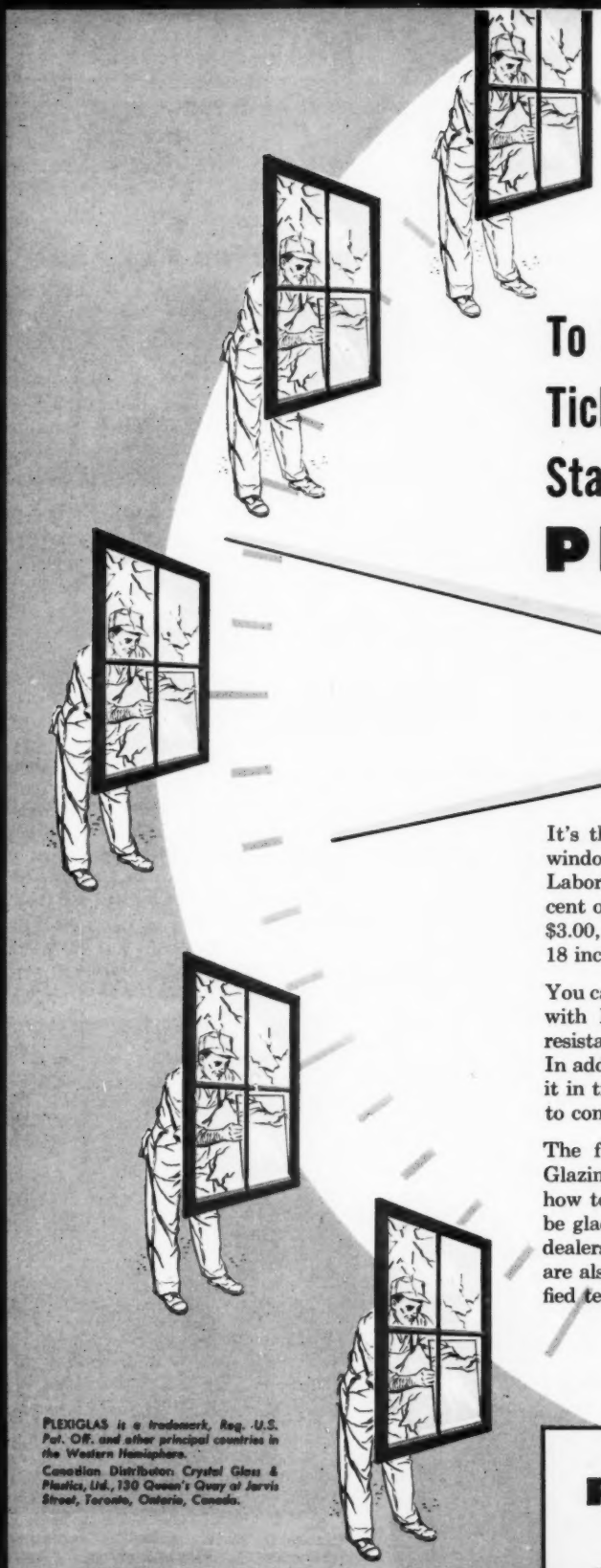
drive 40 to 50 nails a minutes over a sustained period of time. This is about twice as fast as a skilled workman can achieve with a hand hammer. Over brief periods, the rate may be as high as 60 nails driven each minute.

Driving mechanism is contained in a gun-like barrel which is operated by depressing the barrel against the work and pulling a trigger. A safety device prevents the trigger being pulled unless the barrel is fully depressed.

As each nail is driven, another is fed automatically from the hopper through the 25-ft plastic hose to the driving unit.

The driving unit, weighing 8½ lb,

For more facts circle 536 on Reply Card ——→



To Stop Dollars Ticking Away, Start Glazing with PLEXIGLAS

It's the *time* spent in replacing broken plant windows that keeps maintenance costs high. Labor and factory overhead account for 88 per cent of the cost of new windows—$2.65 out of $3.00, the average cost for a single 12 inch by 18 inch pane.

You can cut breakage to a minimum by glazing with PLEXIGLAS acrylic plastic. It is highly resistant to impact, vibration and twisting. In addition, it is crystal-clear, or you can have it in transparent and translucent colored form to control solar heat and glare.

The full story is in our booklet, "Window Glazing with PLEXIGLAS," which tells why and how to use this durable outdoor plastic. We'll be glad to send you a copy, and the names of dealers in your vicinity. Local sources of supply are also listed, under PLEXIGLAS, in the classified telephone directories of many cities.

CHEMICALS FOR INDUSTRY

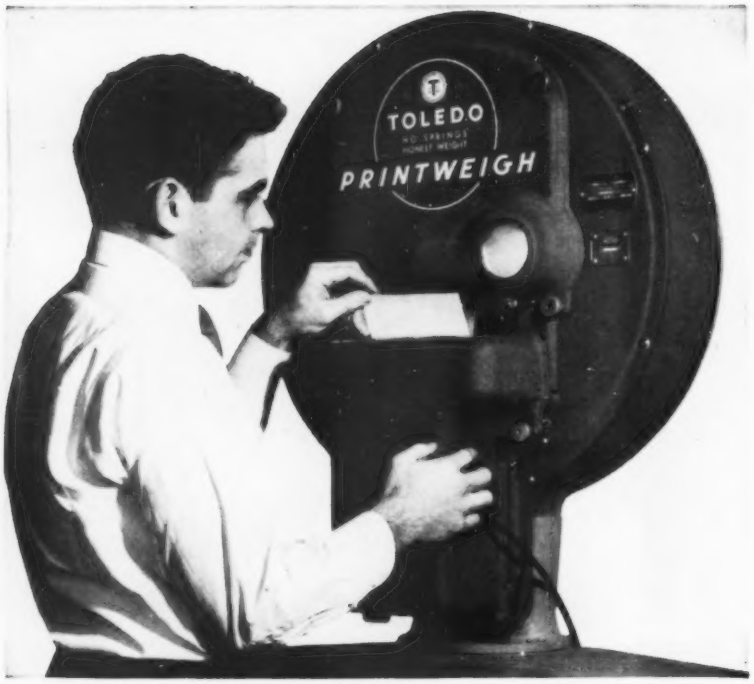
ROHM & HAAS COMPANY

WASHINGTON SQUARE, PHILADELPHIA 5, PA.

Representatives in principal foreign countries

PLEXIGLAS is a trademark, Reg. U.S. Pat. Off. and other principal countries in the Western Hemisphere.

Canadian Distributor: Crystal Glass & Plastics, Ltd., 130 Queen's Quay at Jarvis Street, Toronto, Ontario, Canada.



Control Today's Costs PRINT the Weight!

New Toledo Printweigh Scales meet your needs today for *closer cost control!* Stop human errors in reading, remembering, recording . . . provide accurately printed weights with split-second speed . . . accurately recorded!

Printweighs are available for dial type scales in the great new line of Industrial Toledos! *44 new features* include . . . new clean-line design . . . double-pendulum mechanism in one-piece sector . . . lifetime fulcrum. Send for new condensed catalog No. 2001. Toledo Scale Co., Toledo 1, Ohio.

READY TO SERVE YOU IN MORE THAN 200 CITIES

For practical assistance in the selection of new equipment—for efficient installation—or for dependable, factory-trained service, look to your local Toledo office as headquarters. Phone there for emergency repairs on all makes of scales. Ask about the economy and assurance of Toledo service agreements for regular, periodic inspection—"the ounce of prevention" that guards essential equipment.

TOLEDO®
HEADQUARTERS FOR SCALES

For more facts circle 537 on Reply Card

PLANT ENGINEERS' DIGEST

(Digest begins on page 38)

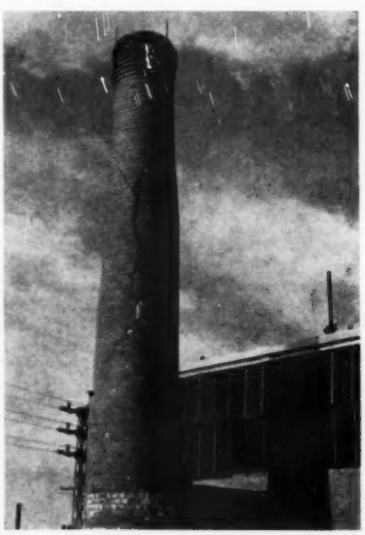
is operated by compressed air at 80 to 90 psi. *From a release for the Morgan Machine Company, Inc., Rochester, N. Y.*

Open Fuel Valve Wrecks Stack

A FUEL VALVE left open and forgotten was the cause of an explosion in a new boiler installation in a paper mill. The explosion damaged the furnace, breeching and smokestack. The blast bent out both banks of water-wall tubes and pushed outward the steel casing around the boiler setting.

Several holes more than six feet long were torn open in the breeching, while the brickwork of the stack was cracked open in three places. As a result, the stack was so insecure that it had to be razed and rebuilt.

The boiler had been shut down in order to tighten a loose fitting in a fuel supply line. To clear the line, a burner valve had been opened, but when repairs were completed, it was not closed. When a fuel pump was started, oil sprayed into the furnace. Vapors from the oil combined with air to form a mixture that drifted throughout the boiler and stack and which exploded when an operator applied a lighted torch. Draft fans, run to prepare the unit for service had not thoroughly purged the unit. *From The Locomotive, published by The Hartford Steam Boiler Inspection and Insurance Company, Hartford, Conn.*

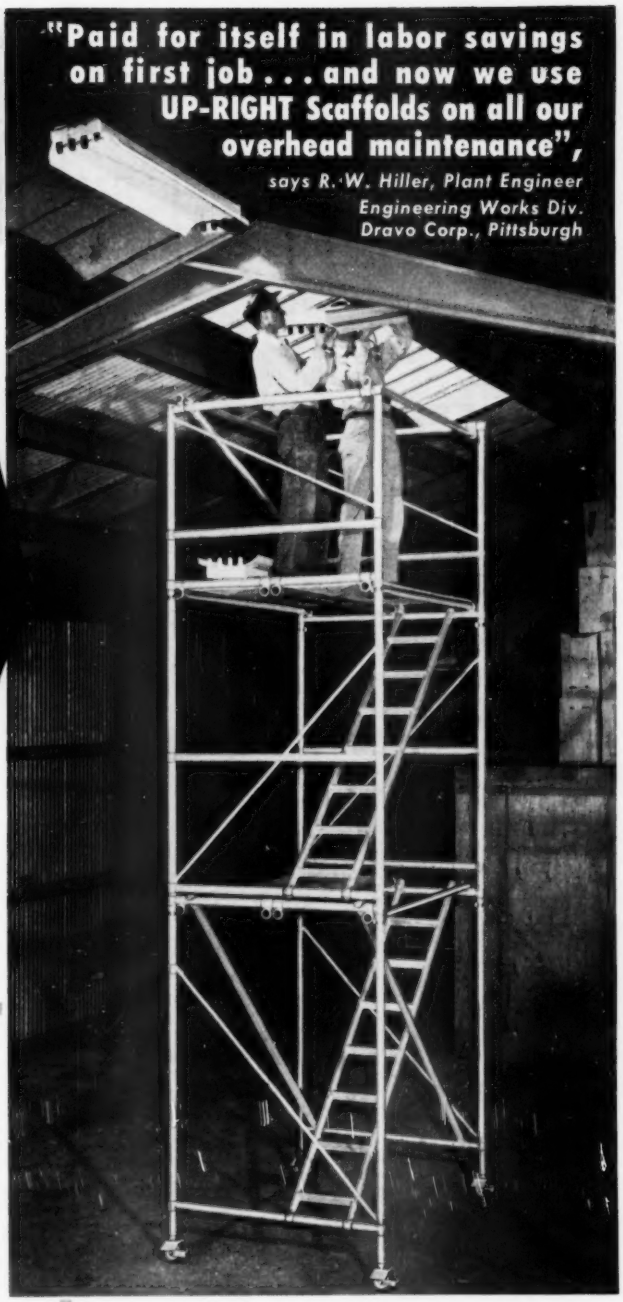


Cracks in stack, caused by explosion, left stack so insecure it was rebuilt

Presto... it's UP!

17 ft. "UP-RIGHT" SCAFFOLD-ON-WHEELS set up in only 3 minutes!

As if by magic, an aluminum alloy tower of any height desired is ready in minutes! Individual scaffold sections are set one on top of the other. Sections lock into place instantly.



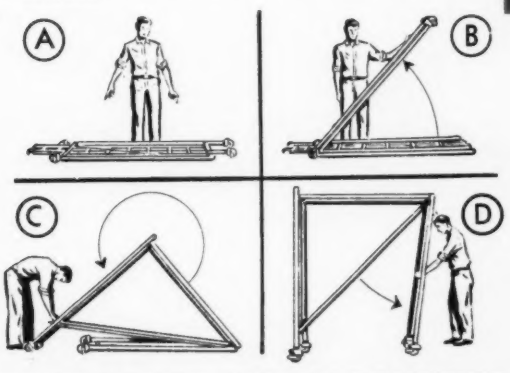
"Paid for itself in labor savings on first job . . . and now we use UP-RIGHT Scaffolds on all our overhead maintenance",
says R. W. Hiller, Plant Engineer Engineering Works Div. Dravo Corp., Pittsburgh

HERE'S THE SECRET!...

PATENTED

ONE-PIECE SECTIONS

Each one-piece section is unfolded by one man in less than a minute! No tools, wing nuts or bolts.



Your maintenance costs can be reduced by "UP-RIGHT" SCAFFOLDS

WRITE FOR DESCRIPTIVE CIRCULAR

"UP-RIGHT" SCAFFOLDS

DEPT. 140 • 1013 PARDEE ST. • BERKELEY, CAL.

Factories: Berkeley, Calif. & Teterboro, N. J.

Offices in all principal cities

For more facts circle 538 on Reply Card

Individual Arc Chambers–

enclosure for contacts

confines the arc . . .

insures against flashover

In Allen-Bradley solenoid starters, each contact unit is enclosed in an individual arc chamber which confines the arc and insures against flashover. Therefore, these switches will easily interrupt not less than ten times the maximum rating at each voltage for which the individual starter is listed.

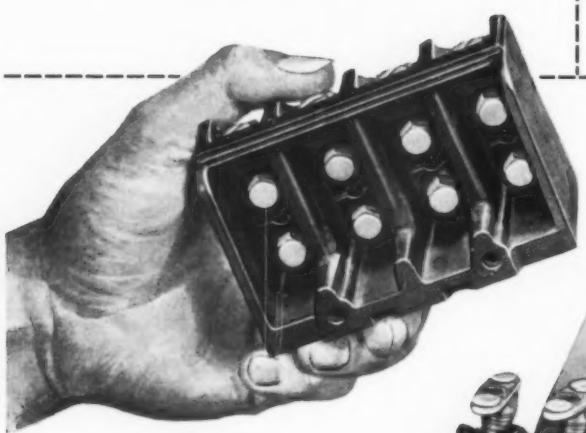
The high magnetic efficiency of Allen-Bradley solenoid switches results in a low pickup voltage. Also, due to the absence of all friction elements in this design, Allen-Bradley contactors are outstandingly consistent in their speed of operation . . . a valuable feature where high speed production tools are concerned.

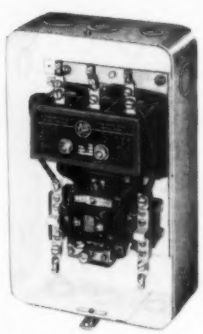
By specifying Allen-Bradley, you are assured of complete reliability in your motor control.

Allen-Bradley Co.
1317 S. First St., Milwaukee 4, Wis.

In Canada—
Allen-Bradley Canada Limited, Galt, Ont.

ALLEN-BRADLEY
SOLENOID MOTOR CONTROL





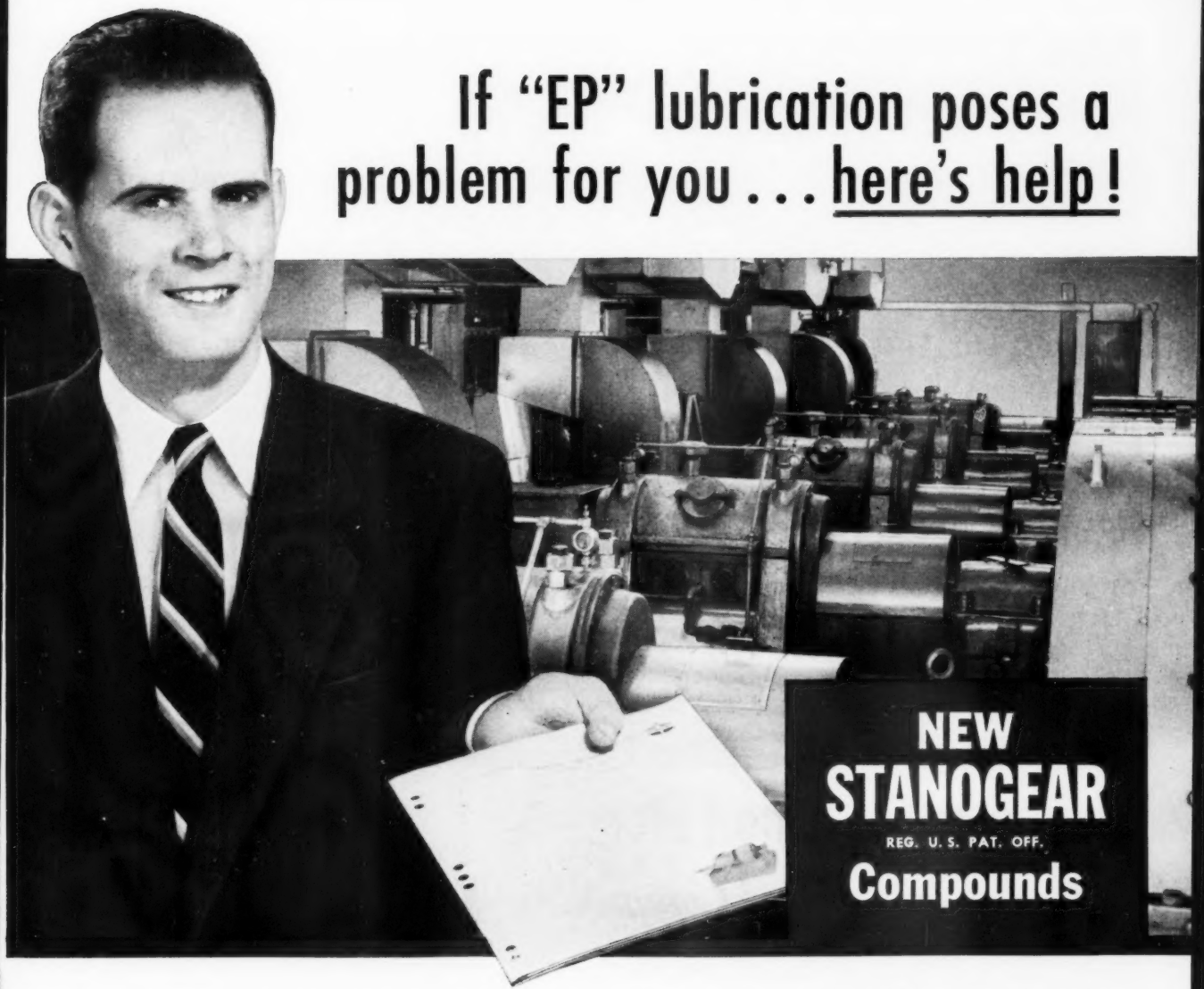
Bulletin 709 Solenoid Starter, Size 2. Maximum Rating: 15 hp, 220 v; 25 hp, 440-550 v.

A-B Quality

The Sign of Quality Motor Control

For more facts circle 539 on Reply Card

If "EP" lubrication poses a problem for you . . . here's help!



Here's new technical letter on Stanogear Compounds—send for free copy today!

If you've been having lubricating problems with overloaded or shock-loaded gears on your equipment, New STANOGEAR Compounds—with 7 better EP lubricating features—are made just for you. New and improved STANOGEAR Compounds are recommended for industrial gear applications where the operating conditions of the gear unit demand an extreme pressure lubricant . . . their superiority has been proved in test after test and *on the job!*

New STANOGEAR Compounds work seven ways better to solve your EP problems: **1.** higher load-carrying capacity **2.** superior retention of load-carrying capacity **3.** freedom from objectionable deposits **4.** excellent storage stability **5.** good water separation **6.** anti-foaming **7.** increased versatility

Now Standard Oil has prepared a special technical letter to give the complete story on STANOGEAR Compounds and EP lubrication. For your copy of this factual, informative bulletin, call your nearest Standard Oil office. The Standard Oil lubrication specialist there can answer your questions and send you a copy of the EP story, without obligation. Or write to: Standard Oil Company (Indiana), 910 South Michigan Avenue, Chicago 80, Illinois.

STANDARD OIL COMPANY

STANDARD (Indiana)

For more facts circle 540 on Reply Card

One of a battery of Staynew Pipe Line Filters keeping impurities out of process compressed air at the Taylor Instrument Companies, Rochester, N.Y.

Staynew Pipe Line Filters *help* *Taylor Instrument Companies* maintain High Quality, Accuracy...

Pictured is part of an assembly line at the Taylor Instrument Companies where highly skilled technicians use compressed air to form the bulbs of precision fever and industrial thermometers. Impurities, no matter how minute, are kept from entering the .002″ bore to maintain high quality control. That's why the Staynew Model CPH-03 Pipe Line Filter is standard equipment at every bench.

Staynew's basic design first eliminates larger particles mechanically. Then, finer air-borne material is removed by the radial fin filter insert. This double action principle reduces the load on the insert making frequent cleanings unnecessary.

There can be no compromise with quality. Millions of thermometers will pass through the Taylor production lines this year where *Accuracy First* is the watchword. Wherever used, Staynew Filters give day in and day out dependable service with low maintenance cost.

Send for Pipe Line Filter Bulletin B-1A

Representatives in Principal Cities

DOLLINGER REG PROTECTOMOTOR U.S. PAT. OFF. STAYNEW FILTERS

DOLLINGER CORPORATION

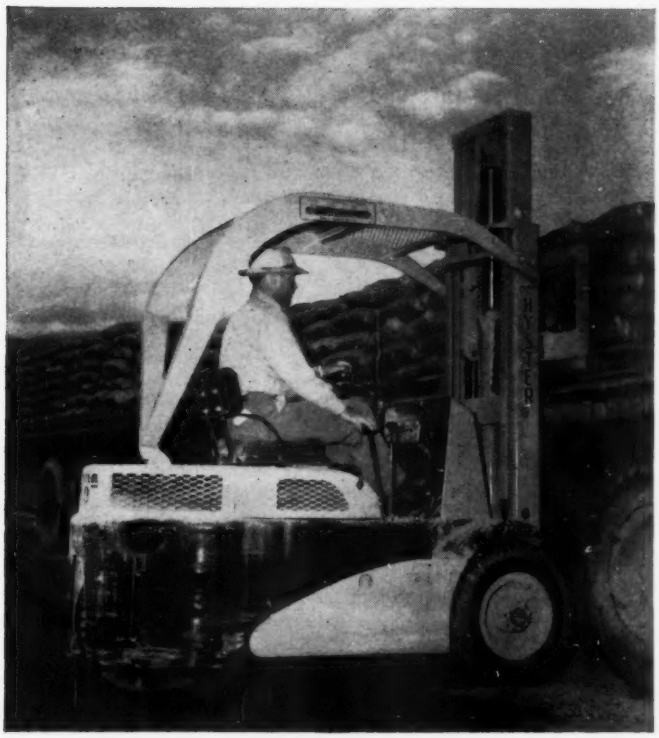
55 Centre Pk., Rochester 3, N. Y.

ALL TYPES OF FILTERS FOR EVERY INDUSTRIAL NEED

For more facts circle 541 on Reply Card

B.F.Goodrich

FREE TW ANALYSIS eliminates tire waste, cuts costs 20-50%



THE money-saving B. F. Goodrich Tire and Wheel Analysis Plan attacks excessive tire costs by uncovering the *reasons* behind tire waste. What causes premature tire failure? Rapid tread wear? Cutting and chipping? The TW Analysis answers all of these questions and many more. This free analysis has cut tire costs 20 to 50% for hundreds of industrial tire users across the country. It can do the same for you!

Contact your BFG retailer or mail the coupon below. Without cost or obligation, a trained B. F. Goodrich man will study your materials handling operations. He will tell you what type and size tire, what tread design and compound will serve you best. He will recommend ways to improve your tire maintenance program. The advice you receive will be unbiased, for B. F. Goodrich makes a *complete* line of industrial tires—solids, pneumatics and semi-pneumatics. A special TW Analysis is available for manufacturers of industrial hauling equipment.

Outside operations? Hauling over rough surfaces can soon ruin good tires not suited to that type of service. The TW Analysis helps you select the right tire for every job.

Tire failures like this cost money! This tire failed prematurely. BFG's TW Analysis helps you discover the reasons for tire failure, prevents reoccurrences, saves you tire dollars.

Heavy loads? Overloaded tires fail prematurely, usually cannot be repaired. Let the BFG man show you how to match tire and load for maximum service at lowest cost.

RESEARCH KEEPS B.F.Goodrich FIRST IN RUBBER

Specify B. F. Goodrich tires when ordering new equipment

The B. F. Goodrich Company
Tire & Equipment Division
Department TW-413
Akron 18, Ohio

Please send me:
- ☐ Additional information on your Tire and Wheel Analysis Plan
- ☐ Free copy of "Industrial Tire Guidebook"
- ☐ Free copy of "How to Get Extra Service out of Solid Industrial Tires"

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Company_____
Street_____
City_____ Zone____ State____

For more facts circle 542 on Reply Card

OPERATION AND PRODUCTION pointers for the industrial plant engineer

Edited by H. E. B. Anderson

Electronic Timer Design

Contributed by Howard T. Bailey, Brillion Iron Works

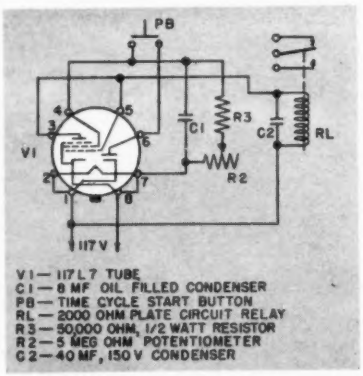
INDUSTRY'S TREND toward automation has thrown new light on the almost unlimited possibilities that electronics has to offer in the field of control and timing.

Our plant uses several electronic timers in various timing and counting operations. Superiority over electric timers is evidenced in one phase, in that the electronic timer can be put back in operation by merely replacing a tube while the electric timer often required complete replacement.

The length of timing cycle depends upon the size of capacitor C-1. An 8-mfd oil-filled condenser will give a timing range of about two minutes, and is fully adjustable over the entire range, using the potentiometer.

When push button PB is depressed, condenser C-1 charges, causing a high negative bias on the control grid of the 117L7 tube, and immediately reducing its plate current to the point where relay drops out. The actual timing cycle is the time required for the condenser C-1 to build up again to the point where the relay pulls in.

The construction of the timer is in no way critical, and after completion it can be calibrated with a stop watch. The only component that requires care in selection is the capacitor, since it must be of the oil-filled type.



Schematic diagram of electronic timer wiring. 117L7 tube is basic component

There are many variations of this circuit that make it suitable for other control operations. One timer can be used to trigger another duplicate timer, or a series of time cycles can be used in a single operation. One installation which we have found satisfactory is made up of five timers, connected to trigger each other in sequence, to control five timed operations

Scrap Ball Bearings Find New Life As Roller Conveyor Parts

Contributed by R. E. Franklin

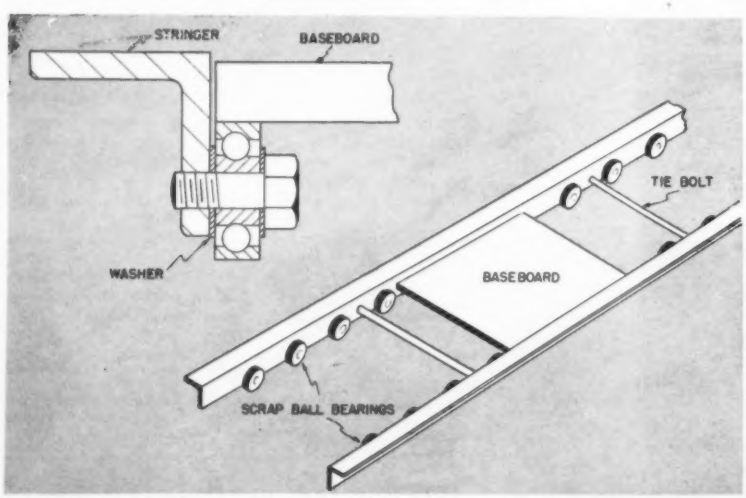
SCRAP MATERIALS can be used for the construction of experimental or temporary conveyors, and the plant engineer of an electrical appliance manufacturer developed an ingenious design for his plant's purposes.

Quantities of used ball bearings were received from field service shops, as they were replaced with new bearings. These bearings were ordinarily sold as scrap steel, until the need for some lengths of conveyor prompted the designing of a conveyor using the scrap bearings for rollers.

Lengths of angle iron form the stringers of the conveyor, held in position with tie bolts (run through standard lengths of steel tubing, to establish the stringer spacing) to hold the stringers properly. A nut on each end of each bolt secured the assembly rigidly.

Rollers made from the scrap ball bearings are placed at intervals along the inner sides of the stringers, and are bolted to the angle iron. Tapped holes in the stringers receive the bolts.

Electrical assemblies of complicated shape are transported on the conveyor, so each unit was placed on a baseboard for handling. These boards, standard equipment throughout the plant, dictated the inside width of the conveyor. The boards ride on the bearing rollers, guided along the conveyor by projecting angle iron stringers.



Roller conveyor features simplicity. Inset shows detail of roller assembly.

Photocopying Techniques

THREE PHOTOCOPYING techniques have been developed at the Arlington, N. J., plant of E. I. duPont de Nemours, Inc., to economize drafting time and speed print production.

When making many copies of an 8½-in. by 11-in. tracing, three transparent positives are made, using ortho vellum paper, thus facilitating the use of an Ozalid machine to run off three copies at one time.

In cases where temporary changes on a tracing are required, instead of changing the original tracing or redrawing the entire part, a negative is made on reflex ortho 005 paper, blocking out the area that is to be changed. A transparent positive is then made from this negative on ortho vellum. Alterations are made on the positive by the drafting room, and the new version is then run on the copying machine. Not only is the original tracing unchanged, but a record of the temporary change is made available for future study.

The results obtained, when trying to make a copy of an old or weak tracing with poor contrast, have been improved by the use of another technique developed at du Pont. To copy

For more facts circle 543 on Reply Card ——→

GE picks waterproof, fireproof FOAMGLAS to insulate Atomic Sphere

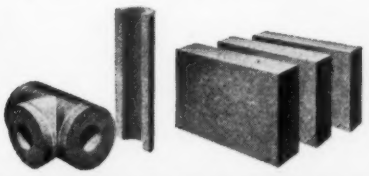
The G. E. Atomic Sphere is 26 times larger than any previously built. It has a surface area of 159,000 sq. ft. Inset photo shows how easily the lightweight FOAMGLAS blocks were handled by the workmen. This rigid insulation was more than strong enough to support their weight, yet easy for them to cut and shape.

General Electric Company engineers picked waterproof, fireproof FOAMGLAS to insulate the world's largest steel sphere. The Knolls Atomic Power Laboratory, Schenectady, which G.E. operates for the A.E.C., will use the sphere to test the prototype of an atomic powered submarine for the U.S. Navy. *Constant* control of temperatures is a must for worker comfort. Therefore, to insulate the sphere FOAMGLAS was a must because its sealed glass cells can't absorb the moisture that cuts efficiency of other insulations. This guarantees GE *constant*, *long-lasting* insulating protection . . . and fireproof FOAMGLAS reduces external fire hazards which might damage the sphere.

Why not discover how FOAMGLAS can benefit *you?* Send today for a sample and your choice of booklets describing the use of FOAMGLAS to insulate: 1) piping, tanks and other equipment; 2) cold storage space; or 3) normal temperature buildings. Write, indicating your specific interest.

PITTSBURGH CORNING CORPORATION
Dept. PE-94, One Gateway Center • Pittsburgh 22, Pa.

FOAMGLAS®
the cellular, stay-dry insulation



PITTSBURGH PC CORNING®
Pittsburgh Corning also makes PC Glass Blocks

OPERATION—PRODUCTION

(O and P begins on page 54)

a weak tracing, a negative is made on reflex ortho 005 paper, and a transparent positive is put on ortho vellum. This positive is then run on the Ozalid machine. This technique obviates the drafting time which would be required to make a new drawing.

Peerless Ortho papers, made by Peerless Photo Products, Inc., are made with an orthochromatic emulsion —sensitive to violet, blue and green light—and have proved well suited for direct copying from blue prints.

Pipe Bending vs Pipe Fitting

Contributed by E. D. Wesley, E. D. Wesley Company

DURING THE INSTALLATION of a heating system in a warehouse at General Mitchell Airport, Milwaukee, Wisconsin, the use of bent pipe in place of pipe fittings saved our company 43 fittings, in sizes from one inch to six inches (only three of the latter). A total of $131.40 in material costs and an estimated 16½ hours of labor time were the direct savings realized.

The installation in this instance was a steam heating system, consisting of a small boiler room and several blowers. Two Tal One-Shot Benders, made by Tal Bender, Inc., were used on the job. With this type bender, all bends were made in one setting of the pipe, without moving it in the bender. These benders have a long ram, with minimum length of 12 in. adjustable to the pipe size, and half circle shoes. Benders which have short shoes, requiring the movement of the pipe during the progress of a bend, have not given us the efficient and economical advantage the one-shot benders have afforded.

Typical bending practices result in easily-formed, neat piping arrangement

In this installation, it took only one 90-deg bend and a slight offset bend to make the layout shown in the illustration. Only one piece of material was handled, and only three bending operations were required. If the same piece of pipe were put in with fittings —at least one 90-deg elbow and one offset—three cuts would have to be made, six threads or welds would have to be made, and three fittings used. A total of four pieces of pipe with three fittings, or seven pieces of material would have to be handled and assembled.

The greatest savings with the bender occurs in installations where, ordinarily, pipe is cut into small lengths, then reassembled into a complete line to fit around any and all obstacles. Bending obviates the necessity for installing a separate fitting for each change of direction.

Light Ladder for Light Man

Photo: Westinghouse Electric Corp.

Light aluminum ladder, rigged with holding rack for luminaire and burned-out lamp at Westinghouse's Sharon, Pa., Transformer plant, features four Micarta laminated plastic "quivers" for the individual replacement lamps

Safety on Wheels

COMPLETE EQUIPMENT for handling any first aid emergency at any point within the 500,000-sq ft plant of Barber-Greene Co., Aurora, Ill., is readily available in a compact, efficient mobile first aid unit, designed and built in the plant.

Consisting of a compartmented, two-wheeled, pneumatic-tired push cart, the unit contains everything needed for first aid work, from a stretcher to an MSA Pneolator (automatic artificial respiration instrument).

Photo: Mine Safety Appliances Co.

Plant nurse demonstrates ease of maneuvering first aid cart in plant areas

Items carried in the mobile unit include a folding stretcher, a special traction board for back and neck injuries, emergency lights, two blankets and a roll of padding, a CO_2 fire extinguisher, Timmins splints and a number of various safety and minor first aid devices.

The first aid room at Barber-Greene is located almost directly in the center of the plant, and when first aid was needed within the plant, either the nurse had to carry all equipment, or vital time was consumed obtaining help to bring all items to the scene. The new mobile unit is easily handled by the nurses, and quickly wheeled to any part of the plant, when needed.

Castings Impregnating Process

MANUFACTURE OF COMPONENTS for many types of aircraft equipment, the efficiency of which depends upon complete pressure tightness, demands that micro-porosity, present in all cast metals, be completely and permanently closed.

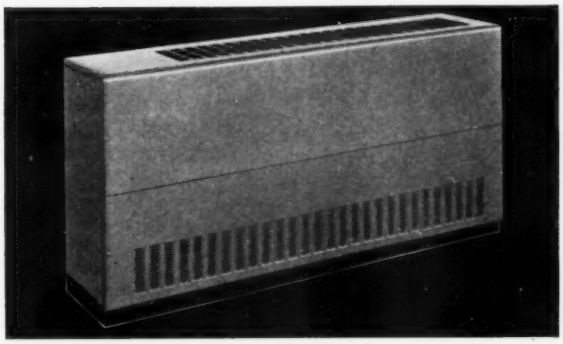
. Stratos Div., Fairchild Engine and Airplane Corp., uses an impregnation process developed by the American Metaseal Mfg. Corp. that prevents leaks and internal corrosion in sand cast and die cast magnesium and aluminum housings. The process uses Metaseal's Hub Unit, and 19V5 polyester impregnating resin in a batch-type vacuum and pressure method designed for simple one-man operation.

Before impregnation, all aluminum sand castings are machined and anodized; after impregnation, some are painted. All aluminum die castings are similarly anodized before impregnation. Some of the magnesium sand castings are dichromated before impregnation.

The castings are placed in an autoclave. Air is removed from the autoclave; this evacuates any pore con-

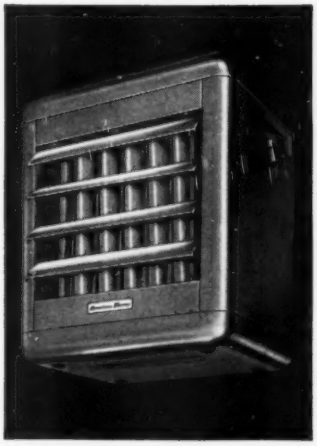
Choose the heater that fits your job best!

American Blower offers you a *complete line* of commercial and industrial unitary-type heaters for maximum flexibility in layout and design!

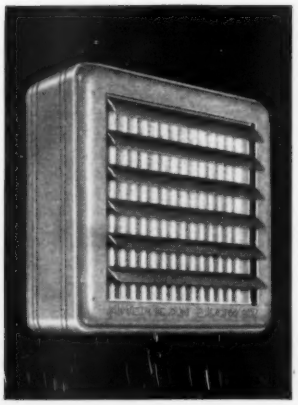


Looking for an attractive and efficient unit heater for your lobby? Office? Showroom? Corridor? Then install American Blower **De Luxe Cabinet Unit Heaters** for steam and hot-water systems! Recessed and non-recessed types for ceiling or floor installation. Finished in attractive gray-green baked enamel. Five basic sizes; permanent or disposable filters.

You can't go wrong if you (1) plan to use gas as fuel on your next heating installation, and (2) use American Blower **Gas-Fired Unit Heaters!** They're compact and modern in design; come in both conventional and duct types, to let you tackle any size job. Use them individually or in combination; easy to install, economical to operate. Capacities: 50,000 to 230,000 BTU/hr input.



Equitemp Air Diffuser on new **Venturafin Vertical Unit Heaters** is adjustable, and permits an even flow of heat. It produces a cone of heated air that mixes with room air—for breathing-level temperatures that vary less than one degree! Anemostat and vane-type diffusers also available. 58,400 to 560,000 BTU at 2 psig, 60°F. entering air.



If you want *both* low price and top heating performance, put in American Blower's new **Venturafin Horizontal Unit Heaters!** They're truly quiet, and have separate coil systems for hot water and steam. Serpentine design of hot-water coils increases output; permits use of smaller units in many cases. Capacities: 18,000 to 357,500 BTU at 2 psig, 60°F. entering air.

* * *

For complete data on American Blower unitary-type heaters, jot down your request on a post card and mail it to: American Blower Corporation, Detroit 32, Mich. Better yet, step into your American Blower jobber's and see them for yourself—today!

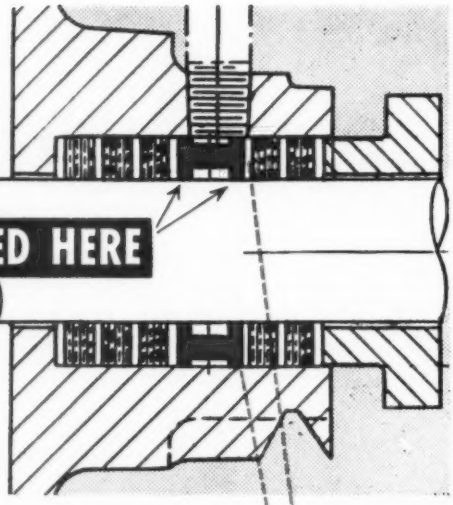
AMERICAN BLOWER CORPORATION, DETROIT 32, MICHIGAN • CANADIAN SIROCCO COMPANY, LTD., WINDSOR, ONTARIO
Division of American Radiator & Standard Sanitary Corporation

AMERICAN BLOWER

Serving home and industry: AMERICAN-STANDARD • AMERICAN BLOWER • CHURCH SEATS & WALL TILE • DETROIT CONTROLS • KEWANEE BOILERS • ROSS EXCHANGERS • SUNBEAM AIR CONDITIONERS

For more facts circle 544 on Reply Card

THE LIFE OF YOUR PUMP SHAFT IS DETERMINED HERE



CHEMPRO TEFLON SEAL CAGES

for lubricating
or cooling
stuffing
box packing

Flexible Chempro Seal Cages do not score the shaft as do two-piece metal lantern rings or other types of metal seals. They save the expense of replacing badly scored shafts in pumps and other processing equipment operating continuously at high speeds.

Machined in a single piece, Chempro Seal Cages snap easily over the shaft and *fit snugly.* No chance of movement or vibration even at very high shaft speeds. Their tough construction prevents bending or collapsing under extreme gland pressure.

For corrosive service, they are unbeatable – lasting many times longer than metal rings. They withstand continuous contact with acids, organic solvents, thionyl chloride, etc. – at normal and elevated temperatures.

Chempro Teflon Seal Cages are made in a wide range of sizes to fit most shaft diameters and stuffing box bores.

Write for complete Chempro Packing and Gasket Catalog.

* du Pont's trademark for its tetrafluorethylene resin

CHEMICAL & POWER PRODUCTS, INC.—
The Original Fabricators of Teflon Packings and Gaskets
7 Broadway, New York 4, N. Y.
For more facts circle 545 on Reply Card

OPERATION — PRODUCTION

(O and P begins on page 54)

nected to the surface of the casting. The impregnant is introduced to the autoclave and compressed air is applied to force it into the evacuated pores. Pressure is released, the castings are removed from the autoclave and cleaned. A curing operation solidifies the liquid impregnant that has been absorbed into the metal

Control panel of impregnating system. Hoist lifts basket from autoclave

structure, and the cured resin is resistant to a wide range of acids, alkalies, solvents and other chemicals.

Heart of the system is a self-contained unit comprising autoclaves, high vacuum pump, thermostatically controlled wash tanks, a mechanical surging unit and a power operated hoist, built around a center hub that mechanizes all operations.

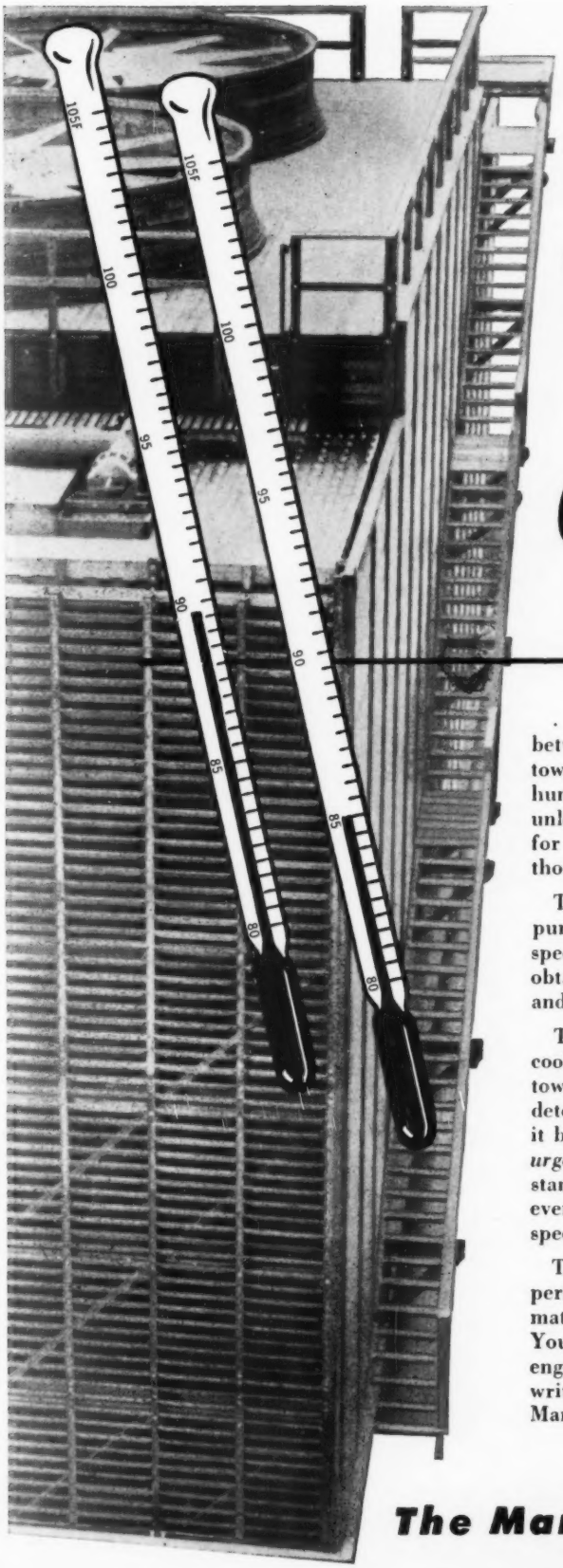
Multiple Drill Press Station

FOR EXACT MACHINING of camera parts on an economical basis, the Calumet Mfg. Co., Chicago, utilizes four Delta 17-in. drill presses, one of them equipped with a quadrill head.

The four drill presses are arranged adjacent to each other to speed up drilling procedures and to minimize handling of heavy jigs. Two presses mounted on a single table are flanked by individually-mounted units.

Drilling operations are done on the table-mounted machines, while the single presses are used for tapping. The quadrill head press is used for drilling four different sized holes.

The drill press setup is used in the machining of an aluminum bellows frame for the Calumet camera. The frame is placed in a heavy jig, and



What's the difference?

. . . just four or five degrees. But if it is the difference between actual and specified performance of a cooling tower, it is ultra-important. You may spend thousands or hundreds of thousands of dollars for a cooling tower; unless it delivers cold water at the temperature specified for economical operation it will cost more and more thousands in power cost or product recovery.

There is only one sure way to get what you pay for—to purchase a tower that will fulfill your performance specifications under test . . . in your plant. You can only obtain such a tower from a manufacturer whose engineering and research facilities are equal to the task.

Thirty years of research devoted exclusively to water cooling and a complete test plant enable Marley's cooling tower engineering staff (largest in the world) to predetermine tower performance scientifically and to verify it by actual test. That is why Marley not only invites but *urges* every customer to test his tower by any accepted test standard. Marley knows and positively guarantees that every tower it offers today will meet or exceed performance specification.

To help you determine this "difference" in cooling tower performance. Marley publishes helpful technical information to assist in testing all types of cooling towers. You can get this valuable information through Marley engineering representatives in all major cities, or by writing to the Technical Services Department of The Marley Company.

Founder-Member Cooling Tower Institute

The Marley Company

Kansas City, Mo.

MARLEY®

For more facts circle 546 on Reply Card

Fyr-Fyter's KARBALOY*

...PUTS OUT MORE FIRE FASTER with LESS LIQUID and PREVENTS FLASHBACK!

HERE'S PROOF! ROARING TEST FIRE OUT...in 11 SECONDS!

*Exclusive Chemical Liquid . . . available only in Fyr-Fyter Loaded Stream INSTANT Extinguishers.

This raging inferno, with flames shooting 20 feet in the air, is an Underwriters' test fire in a 100 square feet pine panel.

When fire is highest, INSTANT'S KARBALOY LOADED STREAM is aimed at fire. The roaring blaze was killed in record time . . . 11 short seconds!

This test fire is conclusive proof of Instant superiority! Karbaloy, the extinguishing liquid developed by engineers now prominent in atomic research, killed the fire in one-third time required by ordinary extinguishers . . . and only two quarts of liquid was used! Karbaloy also fireproofs as it extinguishes . . . preventing flashback or fires in rubber and other combustible materials that start up again *after* being put out by ordinary chemicals.

Fyr-Fyter Instants are designed to stop the *most prevalent fires* in wood, rubber, fabrics and other general combustibles. They require no recharging, except after use, and need no protection from freezing. The long-range Loaded Stream can be discharged at a *safe* distance of 45 to 60 feet to fight flames that cannot be approached at close range. No other extinguisher provides the combination of advantages found in Fyr-Fyter Instant Extinguishers!

Write for details today!

TEAR OUT THIS COUPON AND MAIL WITH YOUR LETTERHEAD

☐ Send full details on Fyr-Fyter Instant Extinguisher.

☐ Send a Fyr-Fyter Representative. Let's talk it over. No obligation.

DEPT. 50 FF-3

The Fyr-Fyter Co.
(FIRE) (FIGHTER)

221 CRANE STREET, DAYTON 1, OHIO

REPRESENTATIVES IN PRINCIPAL CITIES

BRANCH OFFICES: *New York, Boston, Philadelphia, Chicago, Atlanta, Dallas, San Francisco, Portland, Seattle.*

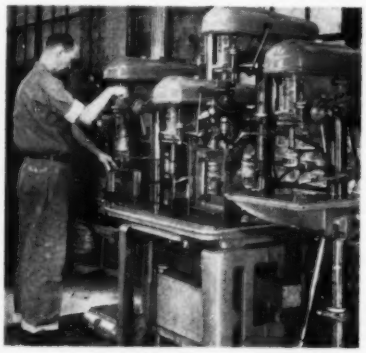
For more facts circle 547 on Reply Card

OPERATION — PRODUCTION

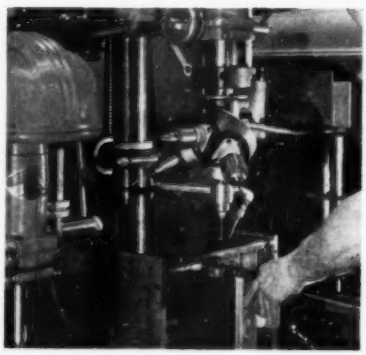
(O and P begins on page 54)

positioned first under the quadrill head for the drilling of No. 3, No. 29, No. 36 and No. 50 holes. The second drill press then drills No. 43 holes.

In the drilling operations, 49 holes



Four-unit drill press station provides maximum work with minimum handling



Quadrill head on press speeds drilling of various sized holes at one station

are drilled, and the frame is then placed in a second jig for tapping.

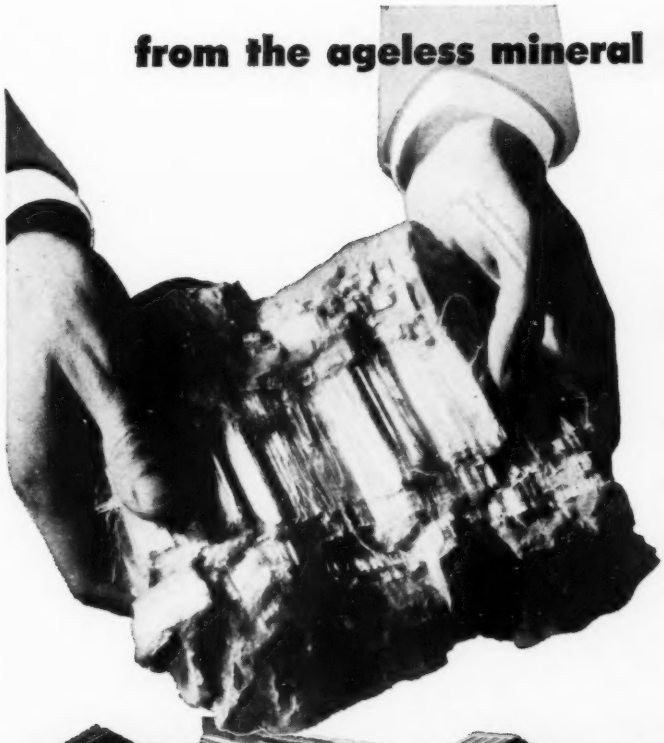
The output from the drilling and tapping station is 6 pieces an hour, and the arrangement permits one man to work the entire operation, or two men to work it—one drilling, the other tapping the drilled holes in another jig.

Fork Truck "Bends Its Elbows"

AN UNUSUAL materials handling problem has been solved at the Gary, Indiana warehouse of the Northern Indiana Public Service Co.

In a building equipped with only a small elevator, it was impossible to move lift trucks from one floor to another. Now, one of the most compact lift trucks available, manufactured by Towmotor Corp., Cleveland, has been fitted with specially modified forks that fold back over the truck,

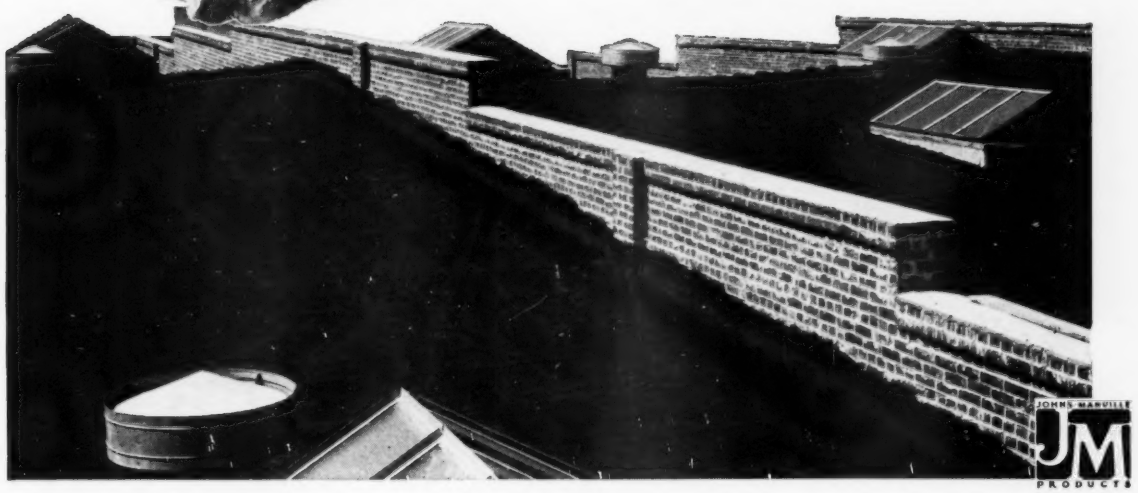
from the ageless mineral **ASBESTOS**



...comes the smooth-surfaced built-up roof

FLEXSTONE*

which provides a flexible covering of stone...

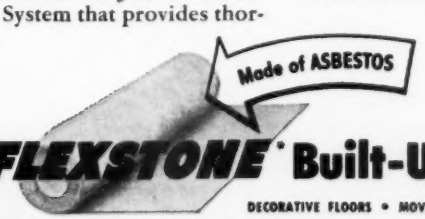


Because they are made of the mineral, asbestos, the felts of a Johns-Manville Flexstone Built-Up Roof assure lasting service and protection. They will not support combustion. They effectively resist the drying-out action of the sun . . . won't rot, are weatherproof and need no periodic coating.

J-M Flexstone Built-Up Roofs are smooth-surfaced . . . permit thorough drainage, make any damage easy to locate and repair. They are engineered to each job . . . and can be applied on decks ranging from dead level to a pitch of 6 inches per foot.

For complete information about Flexstone Roofs and J-M Asbestile* Flashing System that provides thorough water tightness and effective treatment for critical roof areas, see your Approved Johns-Manville Contractor. He's listed in the Classified Section of the telephone directory. Or send for folder BU-51A. Write Johns-Manville, Box 158, New York 16, N. Y. In Canada, write 199 Bay St., Toronto 1, Ont.

*Reg. U. S. Pat. Off.



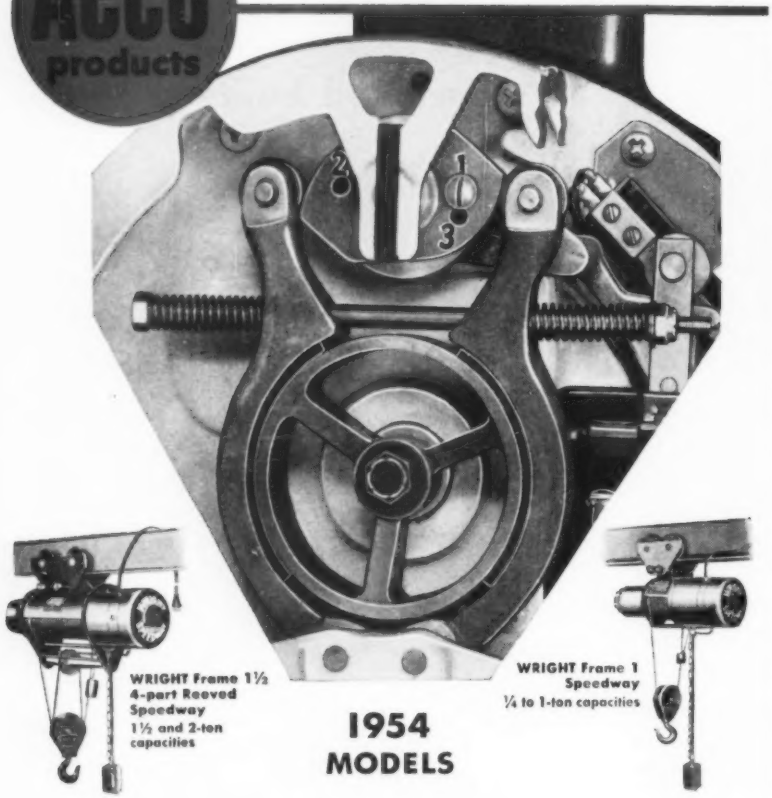
Johns-Manville FLEXSTONE* Built-Up Roofs

ASBESTOS CORRUGATED TRANSITE* • ACOUSTICAL CEILINGS DECORATIVE FLOORS • MOVABLE WALLS • ETC.

For more facts circle 548 on Reply Card

Wright Hoists

ACCO products



WRIGHT Frame 1½ 4-part Reeved Speedway 1½ and 2-ton capacities

WRIGHT Frame 1 Speedway ¼ to 1-ton capacities

1954 MODELS

Nothing to adjust but the cam!

• The brake assembly pictured above for the WRIGHT FRAME 1 SPEEDWAY HOIST is your assurance of maximum hoist service... minimum down time. Adjustment of this cam-actuated brake to compensate for brake lining wear is literally "as simple as ABC." *There is no guess work about it.*

When the load hook starts to drift, remove the screw shown at position No. 1 (*see picture*), swing the cam around so that position No. 2 is in line, and replace the screw that secures the cam to the solenoid lever arm. For the final one-third of brake lining wear, set the cam at position No. 3. This repositioning of the cam is the ONLY adjustment to be made by the users of WRIGHT Hoists. The brake springs and solenoid are factory-set... NEVER need adjustment for brake lining wear.

Long life is a built-in characteristic of these hoists. They are built and guaranteed for service to the limit of the duty cycle of 1½ H.P., 30 minute, totally enclosed NEMA specification motors. These 1954 models provide full accessibility of parts for lowest maintenance costs. To get at the brake and controller, you remove two screws which hold the end cover. To get at the limit switch, transformer, and solenoid coil, you remove three screws and the side cover comes off. With this full accessibility you can make a brake adjustment or replace electrical parts in a matter of minutes.

Remember, PRICE + MAINTENANCE = COST. For full details on the low-cost WRIGHT Frame 1 Hoists see your WRIGHT distributor or write our York, Pa., office for literature.

ACCO

Wright Hoist Division

AMERICAN CHAIN & CABLE

Hoists Trolleys Cranes

York, Pa., Chicago, Denver, Detroit, Los Angeles, New York, Philadelphia, Pittsburgh, San Francisco, Bridgeport, Conn.

For more facts circle 549 on Reply Card

OPERATION—PRODUCTION

(O and P begins on page 54)

Operator backs fork lift truck, modified with "elbow" action, from elevator

permitting it to be driven into the small elevator for vertical transportation to other floors.

The forks themselves are standard —but they are fastened only at the top, and left free at the bottom. This modification, coupled with notches cut into the carriage of the lift mast, permits the operator to fold back the forks quickly and easily, when he wants to enter the elevator.

Unit Heaters Prove Economical In Building Renovation

FLEXIBILITY OF PLANT design is highly valued by plant engineers, and adaptability of the heating system is not the least of the problems to be considered. Since plant expansion or reconversion usually involve changes in production lines, methods, machinery and conveyors, both the heating requirements and the space devoted to heating equipment are affected. To make these changes economically, with a minimum of lost time and wasted space, a unit heating system is well worth consideration.

Several features of a unit heater installation make it especially desirable for a plant where adaptability is required. The unit heater is semi-portable, and can be relocated easily; it is light—a heater weighing about 100 lb has the same heating capacity as an old-style heating system that required over a ton of pipe coil or radiator surface. Also, the lack of duct work is a distinct asset when heaters must be relocated, since unit heater relocating normally involves only changes in the branch supply, return piping and electrical connections.

An example of the use of a unit heating system to solve a heating problem involved in plant expansion

can be seen at Telechron, Inc., manufacturer of electric clocks. To enlarge its manufacturing capacity, Telechron added its Plant No. 6 by renovating the abandoned car house of the street railway system in Worcester, Mass.

Because of the widely different heating needs of streetcars and operators' fingers, radical changes were needed in the existing heating plant. The critical areas, from a heating standpoint, were the hands of the assemblers, the feet of the machine operators and aisles in the storage area.

To complicate the situation, the original ceilings were high, designed to accommodate the streetcars the building formerly housed. In some areas of the plant, false ceilings were installed, and to make heating matters more difficult, balconies were added to obtain more floor space. With these varying ceiling heights, the limited space, and specific comfort needs of the assemblers and machine operators, a unit heating system was definitely indicated.

Horizontal delivery heaters were installed in low ceiling areas and over doorways in the building. To cope with the high ceiling areas, vertical delivery units were installed overhead in the assembly and machining sections. Diffusers were included with the vertical units to prevent hot blasts of air blowing on the assemblers, yet direct plenty of heat to the floor line for the machine operators.

While most manufacturers will not be expanding into space formerly occupied by street cars, Telechron's heating problem is typical of that facing manufacturers converting spaces to new uses. And, in most cases, unit heaters justify their consideration as economical and satisfactory answers to that problem.

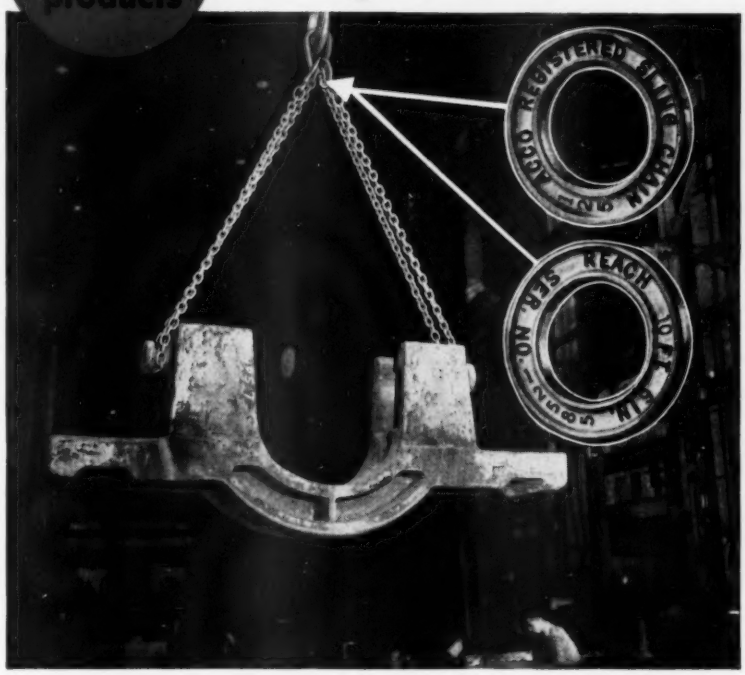
Turntable Checks Grooves

Photo: Norton Company

Checking groove locations in a cylindrical valve part is semi-automatic. Precision turntable mounts 11 dial indicators at heights corresponding to groove locations. As table turns, indicators bear on each surface successively

ACCO products

ACCO Registered* Sling Chains



What would it cost you if you dropped this casting?

• How many times a day do you gamble with a heavy load being lifted over expensive machines—or men? If you have ever dropped a load, you know the consequences. Time lost, damages—a general mess.

That's why you must be sure of the slings you use. That's why we suggest ACCO *Registered* Sling Chains with their inherent safety. For instance, a ⅜" double ACCO *Registered* Sling Chain used as a double-basket at a 60° angle has a working load limit of 11,400 pounds, almost six tons! Furthermore—it was proof-tested—overall—with a load equivalent to *twelve tons.*

With all this strength, ACCO *Registered* Sling Chains are light in weight . . . easy for your men to handle. That's because they're made of alloy chain which provides strength, great strength, with less weight.

There's much more to tell about these fine ACCO *Registered* Sling Chains. Call your ACCO *Registered* distributor today or write us for literature.

*Trade Mark Registered

WHAT "ACCO REGISTERED" MEANS . . .

1 The best material
2 Unit safety factor (on bodies, rings, links, hooks)
3 Proof test of complete sling to twice the working load limit
4 Actual field service test of each design
5 Metal identification ring on each sling
6 Signed Registry Certificate with each sling

ACCO

TRADE MARK

American Chain Division
AMERICAN CHAIN & CABLE

York, Pa., Chicago, Denver, Detroit, Houston, Los Angeles, New York, Philadelphia, Pittsburgh, Portland, Ore., San Francisco, Bridgeport, Conn.

plus Rings Links Hooks

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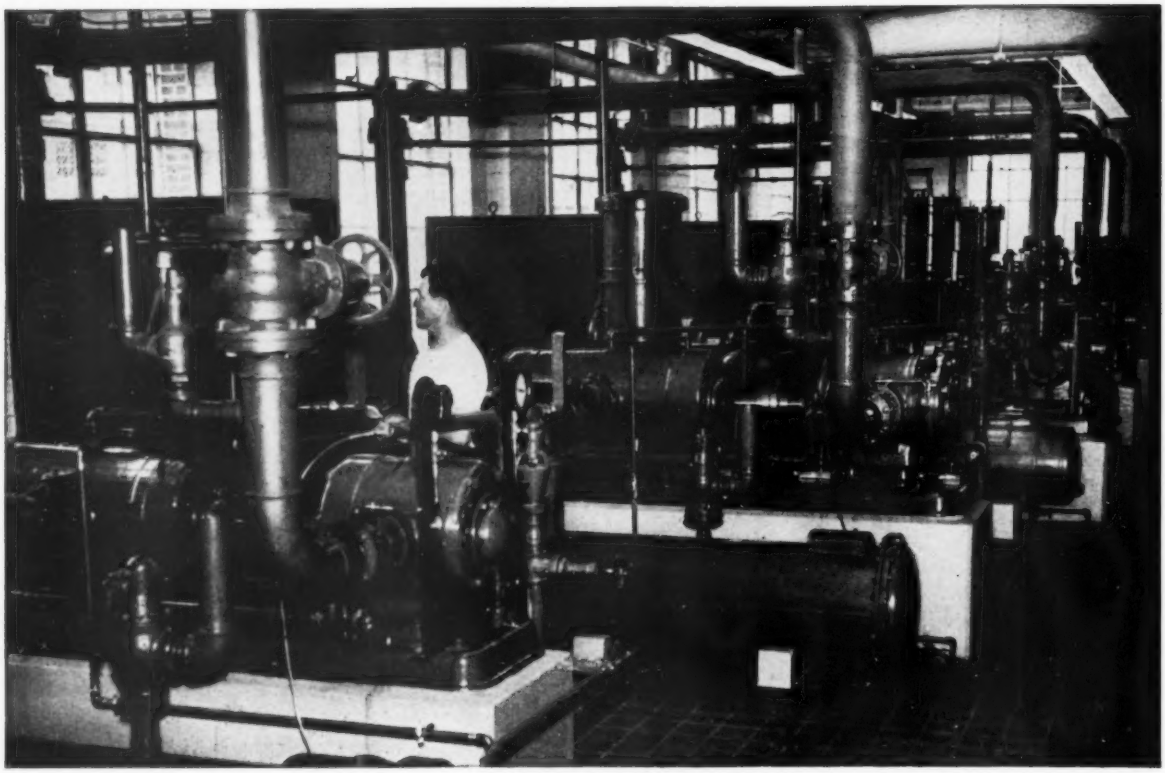

mold Air Power to your needs as this founder does

Six Fuller Rotary Compressors work day after day at Textile Machine Works, Reading, Pa.

Compressed air, produced in one central location, is used for many foundry operations at Textile Machine Works, Reading, Pa., makers of full-fashioned hosiery machinery.

Many molding operations are mechanized at Textile Machine Works, using compressed air. Sand supply-hopper gates are opened by compressed air, jolt-squeeze machines operate with compressed air, pattern plates are removed from molds with air—sand blasting, core making, compacting flask sand, handling push-pallet plates—a whole group of foundry operations simplified by the use of compressed air supplied by Fuller Rotary Compressors.

Starting with a two-stage Fuller Rotary Compressor in 1943, this company has added more compressors as production was increased, until recently the sixth unit was added, supplying a total of 6800 cfm at 125 psi. Each addition was a Fuller Rotary Compressor, a sure indication of reliability and economy of operation.

In your own foundry or process operations, compressed air can save time and money—especially when it is supplied by reliably efficient Fuller Rotary Compressors. Don't overlook the advantages of *air power*—put it to your work—write now for complete information.

Fuller

Pioneers of high-efficiency vane-type rotary compressors

FULLER COMPANY
Catasauqua, Pa.

Branch Offices: Chicago • San Francisco • Los Angeles • Seattle • Birmingham

C-236
2046

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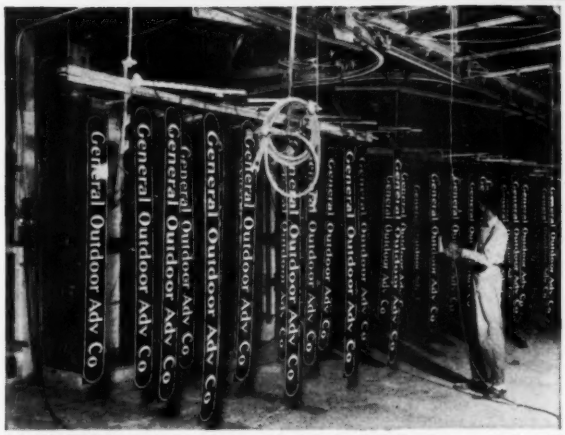
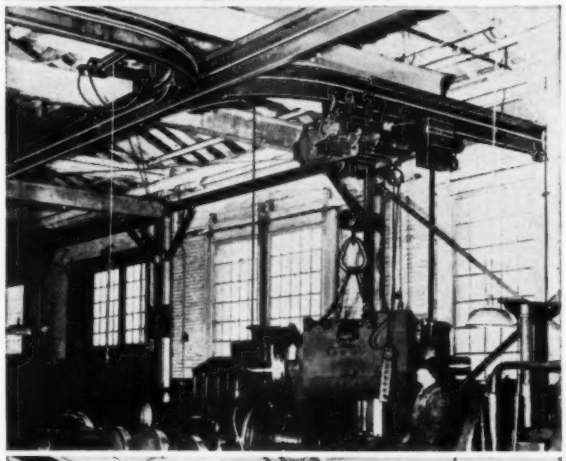
what MONORAIL can do . . .



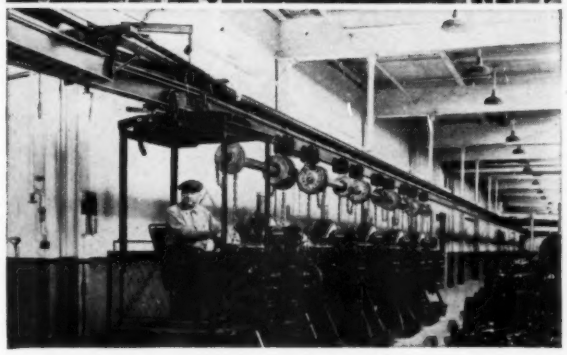
WHERE SPACE IS LIMITED

MonoRail relieves operating congestion by transferring materials handling to unused overhead area. Equipment can often be installed with no loss of production.



TO MOVE VARIABLE LOADS

Any size or shape of load, within the capacity of a MonoRail system, can be moved by using slings, grabs or other quickly changed "below the hook" devices for hand or electric operation.



FOR LOW MAINTENANCE COSTS

American MonoRail equipment is specially engineered and carefully built for long-life, rugged service. Manual or automatic operation continues with little or no downtime for maintenance or repair.

Send for Bulletin C-1 illustrating hundreds of successful MonoRail installations.

AMERICAN OVERHEAD HANDLING EQUIPMENT

AMERICAN MONORAIL COMPANY

13123 ATHENS AVENUE • CLEVELAND 7, OHIO

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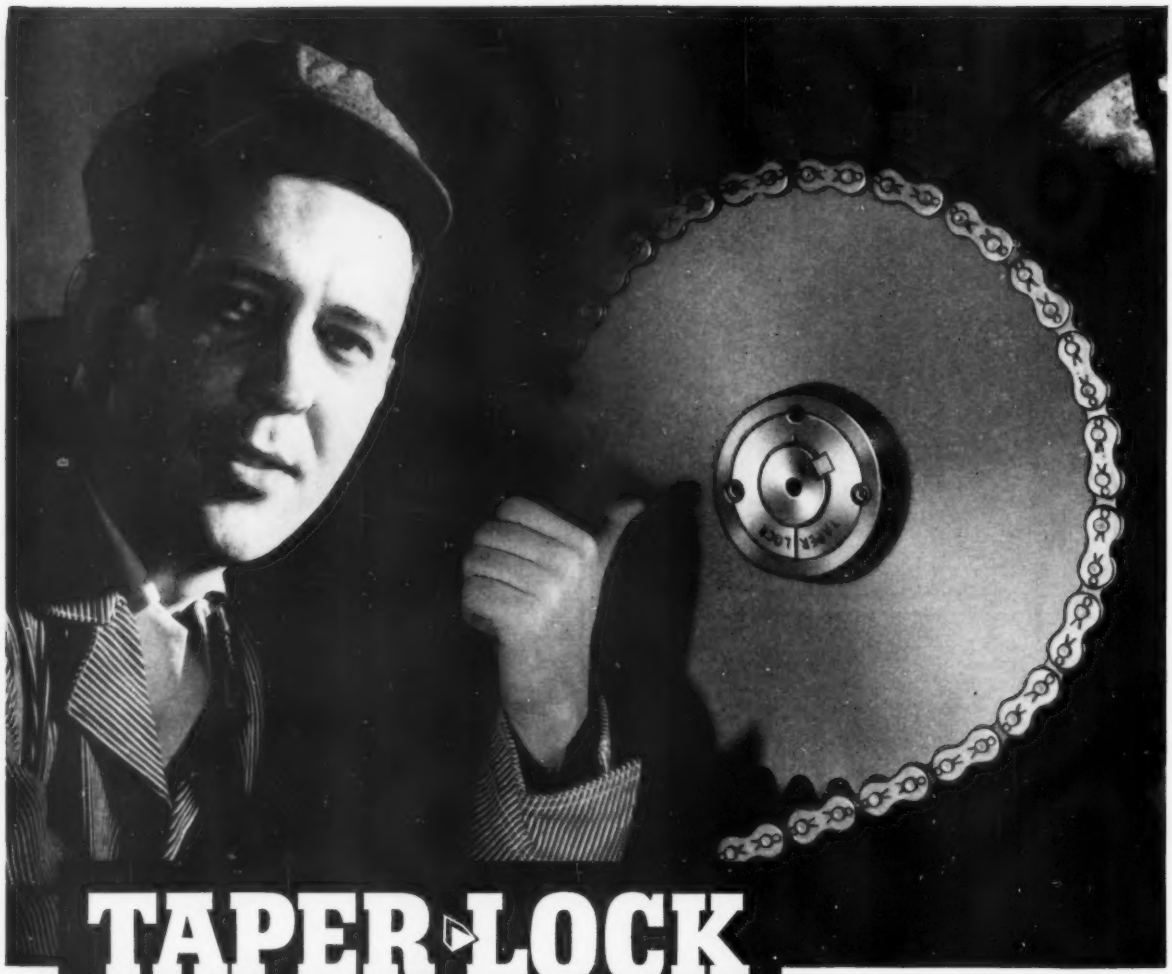


TAPER-LOCK

A PATENTED PRODUCT OF DODGE

Holds so tight it will twist a cold-rolled shaft!

Yes, the Taper-Lock bushing really grips the shaft—holds with the firmness of a shrunk-on fit. It seats evenly along the entire length of the hub. There's no collar, no protruding part, no flange to prevent uniform compression. Having full contact with both hub and shaft, the Taper-Lock bushing holds so tight it would twist a cold rolled shaft before it let go. *Until you want to demount it!* Then a few turns of a hex wrench will release it quickly and completely, without shock to bearings or machinery. For the full story call your Distributor—or write to

DODGE MANUFACTURING CORPORATION, 2700 Union St., Mishawaka, Ind.

THERE'S ONLY ONE TAPER-LOCK, THE BUSHING THAT MOUNTS FLUSH!

Standardize, economize with Taper-Lock, the bushing that is interchangeable in Dodge sprockets, sheaves, couplings and conveyor pulleys. *More than 2,000,000 in use!*

CALL THE TRANSMISSIONEER, your local Dodge Distributor. Factory trained by Dodge, he can give you valuable assistance on new, cost-saving methods. Look for his name under "Power Transmission Machinery" in your classified telephone directory, or write us.

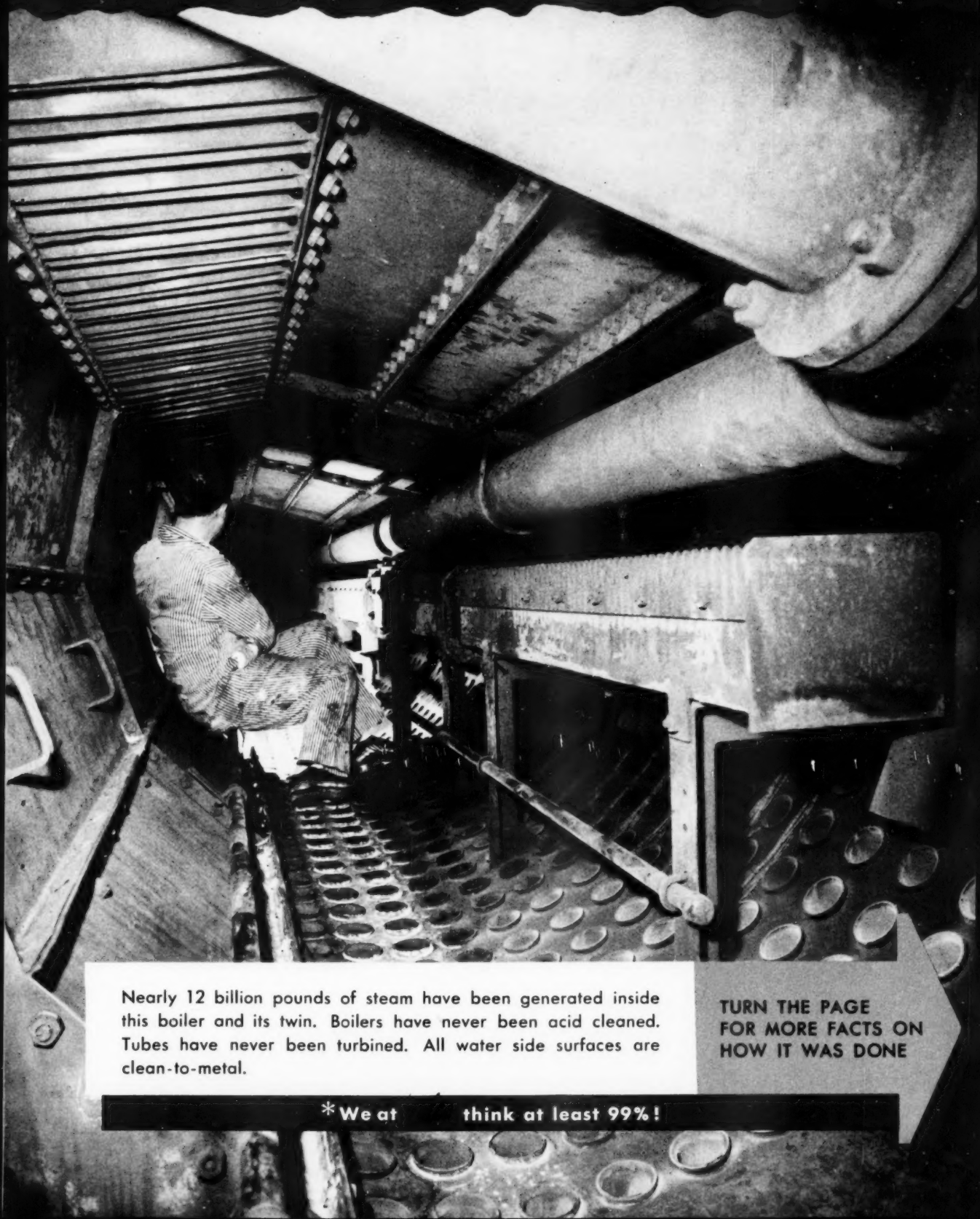
DODGE

of Mishawaka, Ind.

For more facts circle 553 on Reply Card

For more facts circle 554 on Reply Card ⟶

Proof of PERFECT* Water Treatment PERFORMANCE



Nearly 12 billion pounds of steam have been generated inside this boiler and its twin. Boilers have never been acid cleaned. Tubes have never been turbined. All water side surfaces are clean-to-metal.

TURN THE PAGE FOR MORE FACTS ON HOW IT WAS DONE

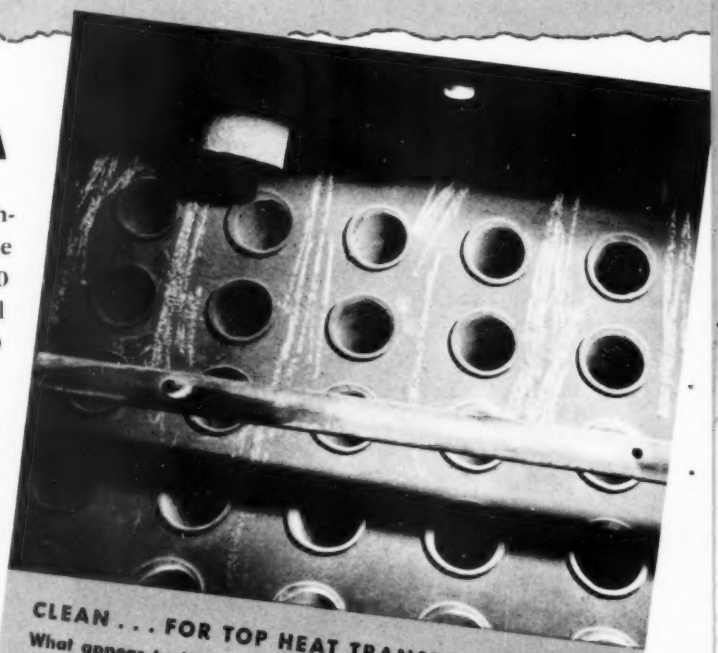
*We at think at least 99%!

BOILER OPERATING DATA

● Two new boilers were put on line in a Southwestern municipal utility plant at the same time late in 1949. Rated capacity of each unit is 250,000 pounds of steam per hour at 950 p.s.i. Normal operating rates range from 150,000 to 175,000 pounds of steam per hour per unit.

The Nalco System of water treatment has been used continuously in these boilers. Raw water softening is by Nalcite* Ion Exchange Resins, and other Nalco products are used for after-treatment, internal treatment, and condensate return line protection. Results have been perfect. Boilers have never been turbined or acid cleaned, and are opened only for annual internal inspection.

Registered Trademark



CLEAN . . . FOR TOP HEAT TRANSFER EFFICIENCY
What appear to be chalk marks in this unretouched photo are scrape marks which indicate only the usual powdery film left on the metal when the boiler is drained.

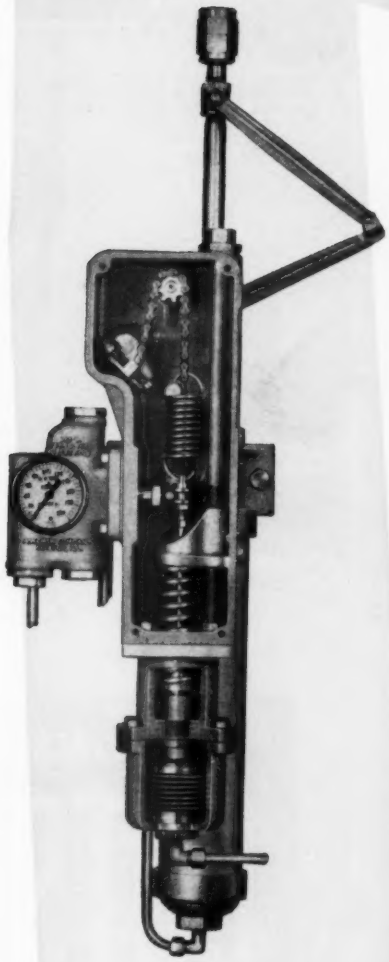
AND THE MUD DRUM IS SPOTLESS, TOO!
Another unretouched photo inside the mud drum of one of the boilers shows the like-new condition after years of service. No deposits or corrosion of any kind have been found in tubes or drums.

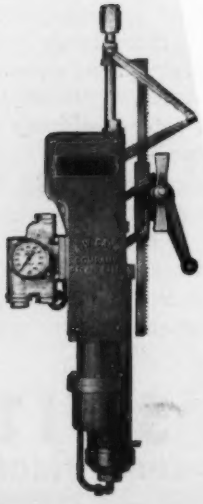
Nalco ON THE JOB

● Results like these are encountered every day in plants when the complete Nalco System of water treatment is on the job. The Nalco System is adaptable to old and new plants of any capacity, temperature, or pressure. Whether you operate a public utility or a space heating boiler, you will find your Nalco Representative of real assistance in the solution of your water treatment problems. Call him today, or write for full information.

NATIONAL ALUMINATE CORPORATION
6216 West 66th Place • Chicago 38, Illinois
In Canada: Alchem Limited, Burlington, Ontario

THE *Nalco*® SYSTEM . . . Serving Industry through Practical Applied Science





The CASH STANDARD 100 Series Automatic Controllers will position levers, electrical controls, valves and other processing equipment to the most exacting degree of accuracy.

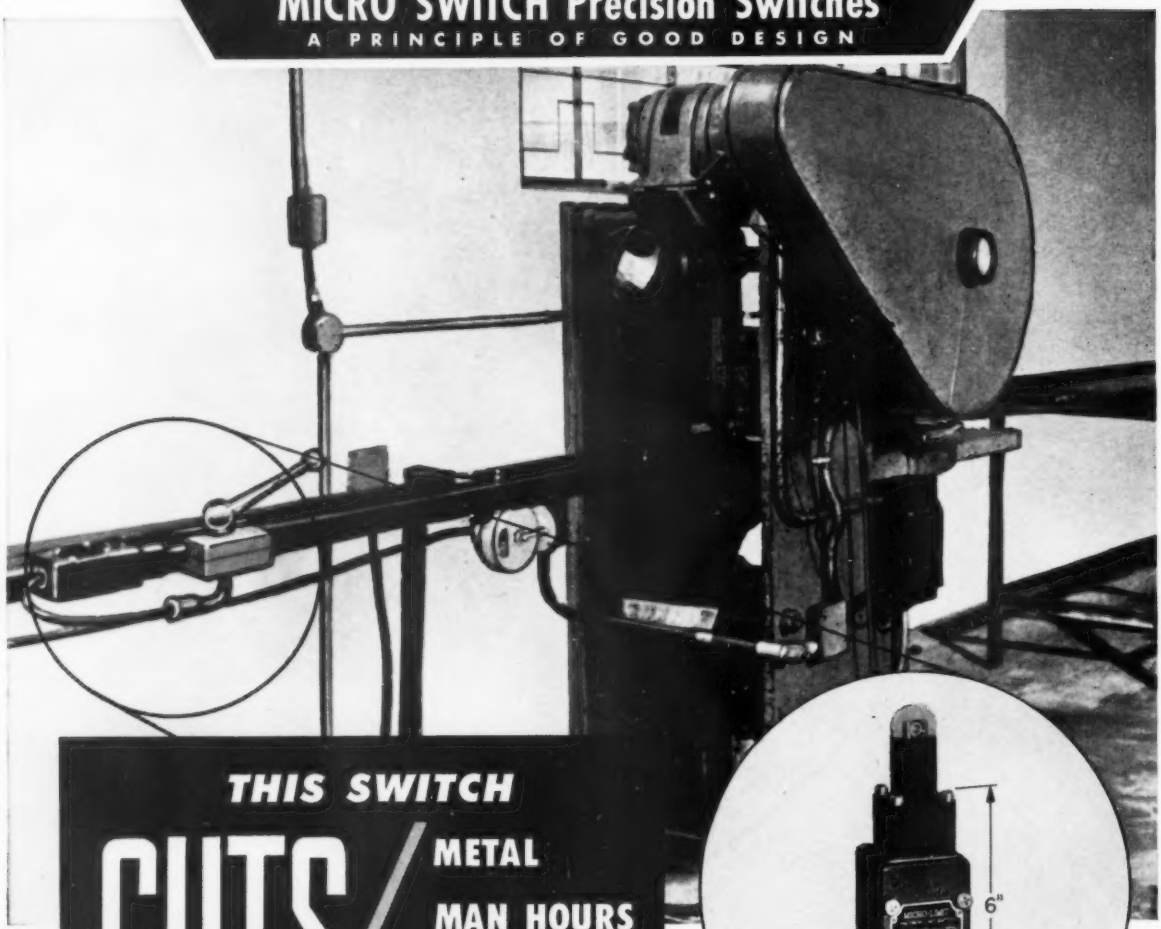
CASH STANDARD

P. O. BOX 551, DECATUR, ILLINOIS

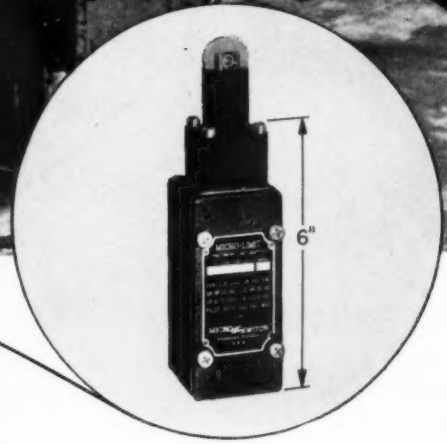
For more facts circle 555 on Reply Card

MICRO SWITCH Precision Switches

A PRINCIPLE OF GOOD DESIGN



THIS SWITCH CUTS METAL MAN HOURS OPERATING COSTS



• Shown here is a combination roller-leveling and cut-to-length machine on which a MICRO SWITCH heavy duty limit switch is installed.

"This switch not only dispensed with the need of one man, but speeded up the operation of the machine by some ten to fifteen percent," say the plant operating people.

The switch, which operates the cutter, is set at the proper length, and as the flattened stock strikes the switch, the shear cuts the metal. Only function performed by the operator is to unload the cut pieces.

Plant operators, maintenance men, electricians are constantly finding new ways to make present equipment more automatic through the use of MICRO SWITCH precision switches. This makes older machinery safer to operate and more productive.

MICRO SWITCH distributors, with full stocks of the switch types which have proved most useful in plant applications, are located near you. Look in the yellow pages of your phone book under "switches, electric." MICRO SWITCH switches can cut your operating costs, too.

MICRO SWITCH provides a complete line of extremely reliable, small-size, high-capacity, snap-action precision switches and mercury switches. Available in a wide variety of sizes, shapes, weights, actuators and electrical characteristics. For all types of electrical controls.

MICRO SWITCH

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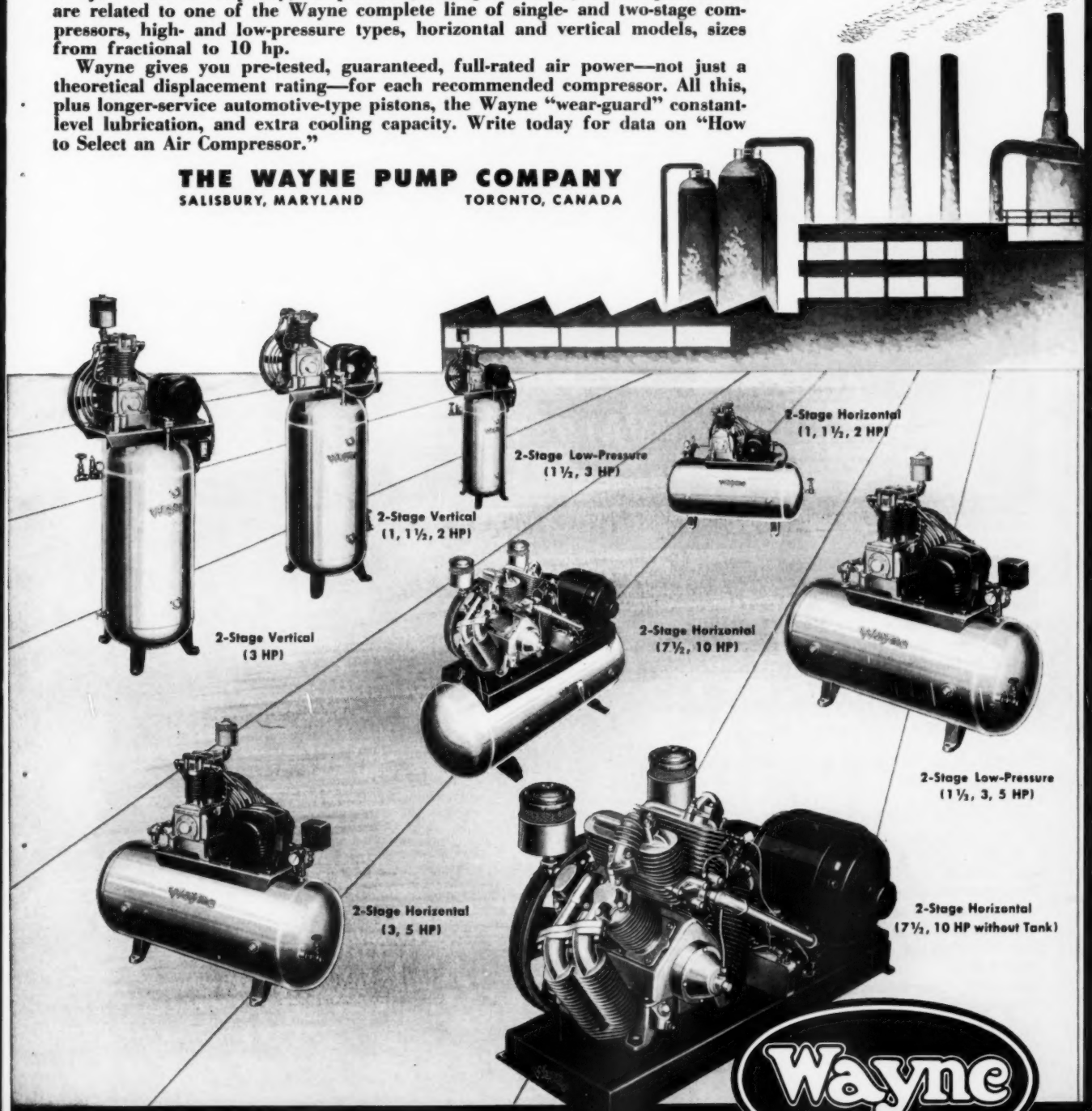
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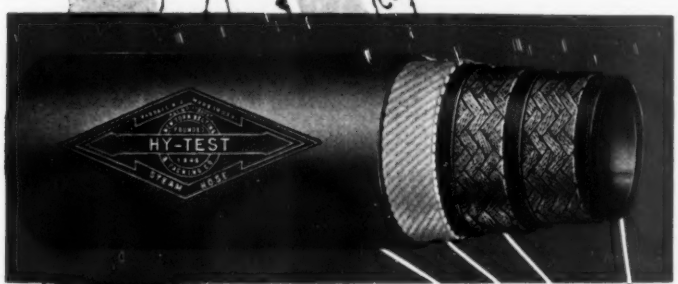
For your workers' safety and morale—and long-range economy, too—specify HY-TEST for high pressures! Your nearby NYB&P Distributor has it. If he's not listed in your local classified directory, write to address below.



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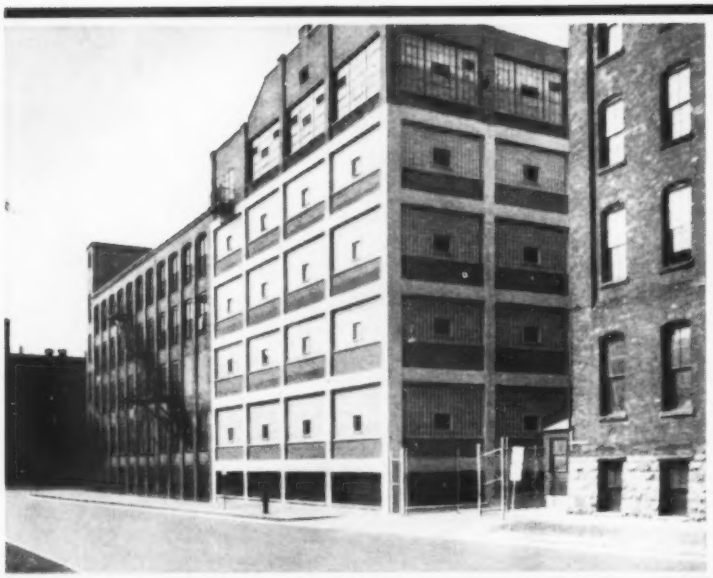
BEFORE

OWENS-ILLINOIS GLASS BLOCK*

(deteriorated sash plus high maintenance costs)



AFTER

OWENS-ILLINOIS GLASS BLOCK

(A pleasant, cheerful atmosphere and no maintenance)

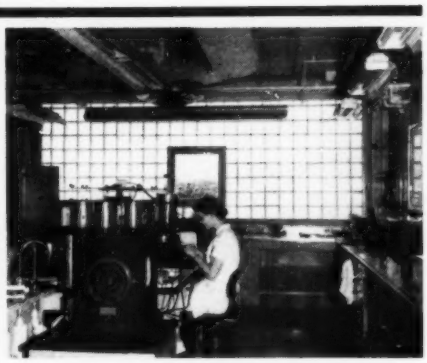
WHEN THE Upjohn Company, Kalamazoo, Michigan, transferred its pharmaceutical manufacturing operation to a new plant, it was decided to convert this 30-year-old building into laboratories devoted to the study of Pharmacology and Endocrinology.

One of the first problems that had to be solved was what to do about sash replacement. The original sash had deteriorated so badly it took continual, expensive maintenance to provide proper weather protection.

Since all of the laboratories were to be air-conditioned, Owens-Illinois Glass Block were selected because they promised savings in operating expenses as well as economical installation costs. The glass block modernized the entire building exterior and brought it up to date, despite the actual building age.

If you are in the process of remodeling old structures or building new ones, don't overlook the positive advantages that panels of Owens-Illinois Glass Block bring. For information and help with your plans, write Kimble Glass Company, subsidiary of Owens-Illinois, Dept. PE-9, Box 1035, Toledo 1, Ohio.

Formerly known as INSULUX



Abundant daylight

is brought into the laboratories at all times of the day. And, because glass block have little affinity for dirt and dust, hospital-clean conditions prevail.

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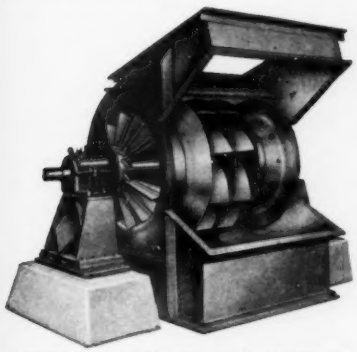
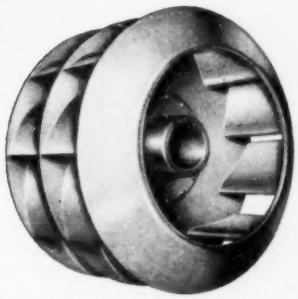


Heavy-duty Airfoil fan with section of housing removed to show wheel assembly. Air Volume is controlled by inlet vanes.



Each Airflow Blade is die-formed and reinforced to insure maximum rigidity.

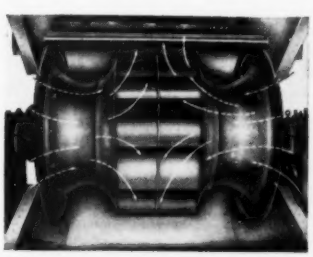
Aerodynamics applied to centrifugal fans:

Westinghouse Airfoil Blading Boosts Fan Efficiency to 92%

Quieter operation, too, for all heavy-duty applications

Westinghouse incorporates the airflow principle of an airfoil section into centrifugal fan wheel design to produce exceptionally high fan efficiencies! Performance proved, this Non-overloading Centrifugal Fan with Airfoil Blading reaches peak mechanical efficiencies of 92 percent . . . cuts noise level as much as 65 percent! Here's why: streamlined inlets that give smooth, full flow of air to the wheel . . . revolutionary Airfoil blades . . . improved housing that reduces turbulence. Benefit to you: a high-efficiency fan that pays for itself through yearly power savings.

This remarkable fan insures low operating cost and quiet operation in mechanical draft . . . high-velocity air conditioning systems . . . heavy-duty industrial applications . . . vehicular tunnel ventilation. For full information, contact your local Westinghouse-Sturtevant office, or write: Westinghouse Electric Corporation, Sturtevant Division, Hyde Park, Boston 36, Mass.



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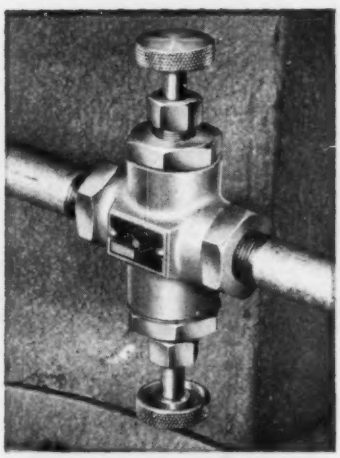

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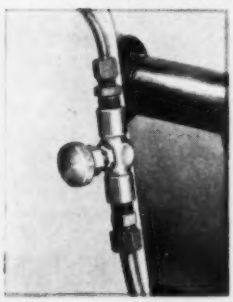

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CONSTRUCTION BRIEFS —a review of fundamentals for the plant engineer

Prepared by Byron A. Engelbach, Plant Engineer

HORIZONTAL SHEAR

The subject of Vertical Shear has been covered in a previous Brief. Horizontal Shear has been referred to and needs further clarification, especially in the case of wooden construction.

The fact that two adjacent portions of a body may have a tendency to slide by each other establishes the Shear Stress. Horizontal Shear is that shear stress acting at right angles to the vertical shearing plane.

Assume two trestles or horses upon which have been placed six 1-in. by 6-in. boards of the same length. Refer to Fig. 1-B. Note the ends of the boards will be perfectly in line and with no load on the boards they will be quite level. If a heavy load is placed in the center of the span, a sag will appear and the several boards will no longer be level. In addition, it should be observed that each board has slipped by its neighbor so that the ends of the boards will appear as in Fig. 1-A, no longer even. This horizontal motion of one board over the other is actually a graphical representation of horizontal shear reaction.

If it is assumed that each board has been securely glued to the adjacent board, and a load which would not cause an actual rupture of the glue were applied, the ends of the pile of boards would remain even and square. There is still a tendency for the boards to slide by each other, but the glue resists this horizontal shearing action.

When the pile of boards is replaced by a 6-in. by 6-in. beam and a load is applied, the beam will bend or sag slightly. There is the same tendency for one portion of the beam to slide by its adjacent portion and this is resisted by the fibers in the beam. This resistance is referred to as Horizontal Shearing Strength.

Certain fibrous materials tend to fail from horizontal shear more readily than others, such as wood when compared with steel, where wood certainly has cleavage surfaces in the grain and steel is practically free of such surfaces. Wood or timber has a much lower shearing strength parallel to the grain than across the grain, which results in a short beam being more apt to fail from horizontal shear.

Without going into the theory and technical explanation, it is sufficient to state simply that the unit horizontal shear equals the unit vertical shear at any point in the beam.

The unit horizontal shear at any point in a beam is equal to the total vertical shear across the vertical section, multiplied by the area above the horizontal section, multiplied by the distance from the neutral axis to the center of gravity of the area, divided by the product of the moment of inertia of the cross section of the beam and the width of the beam.

The Horizontal Shear Formula expressed in symbols is:

$$S_h = \frac{z\,A\,V}{I\,b}$$

where S_h = Horizontal shear in psi
z = Distance from neutral axis to center of gravity of area in inches
A = Area above neutral axis
V = Total vertical shear at vertical section in lb
I = Moment of Inertia of section of beam
b = width of beam

Problem: Beam, 4-in. by 10-in., simply supported, carries a superimposed load of 1000 lb. Find the horizontal shearing stress adjacent to supports at neutral axis, at sections 1 in., 2 in., 3 in. and 4 in. from, and on the outer fibers above, the neutral axis.

Data: Refer to Fig. 2.

Solution: The vertical shear at each end support is equal to the reaction.

Therefore $V = R\text{-}1 = \frac{1}{2}W = 1000$ lb

Moment of Inertia of the beam is

$$I = \frac{4 \times (10)^3}{12} = 333.3$$

1. S_h at neutral axis X-Y

$A = 4 \times 5 = 20$ sq in.

$z_1 = 2.5$

By substitution in formula:

$$S_h = \frac{2.5 \times 20 \times 1000}{333.3 \times 4} = 37.5 \text{ lb}$$

2. S_h 1 in. above neutral axis

$A = 4 \times 4 = 16$ sq in.

$z_2 = 3$

$$S_h = \frac{3 \times 16 \times 1000}{333.3 \times 4} = 36 \text{ lb}$$

3. S_h 2 in. above neutral axis

$A = 4 \times 3 = 12$ sq in.

$z_3 = 3.5$

$$S_h = \frac{3.5 \times 12 \times 1000}{333.3 \times 4} = 31.5 \text{ lb}$$

4. S_h 3 in. above neutral axis

$A = 4 \times 2 = 8$ sq in.

$z_4 = 4$

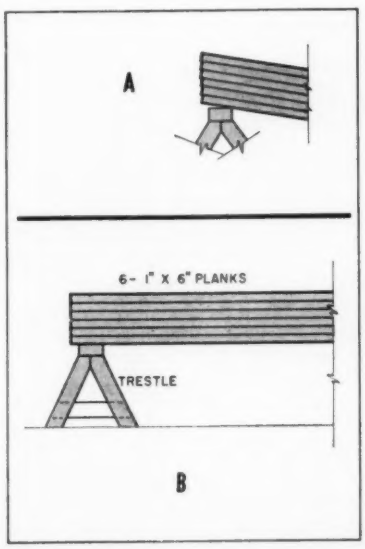
$$S_h = \frac{4 \times 8 \times 1000}{333.3 \times 4} = 24.0 \text{ lb}$$

5. S_h 4 in. above neutral axis

$A = 4 \times 1 = 4$ sq in.

$z_5 = 4.5$

$$S_h = \frac{4.5 \times 1 \times 1000}{333.3 \times 4} = 13.5 \text{ lb}$$



Figs. 1-A, 1-B. Horizontal shear reaction

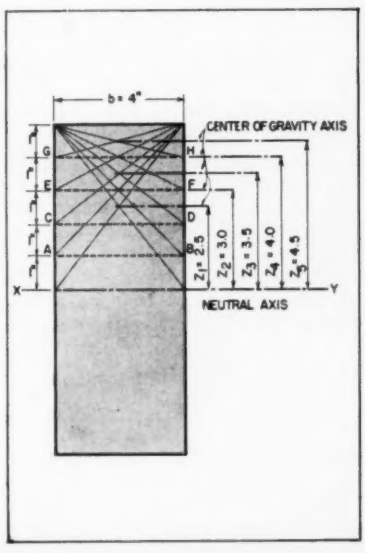


Fig. 2. Find horizontal shearing stress

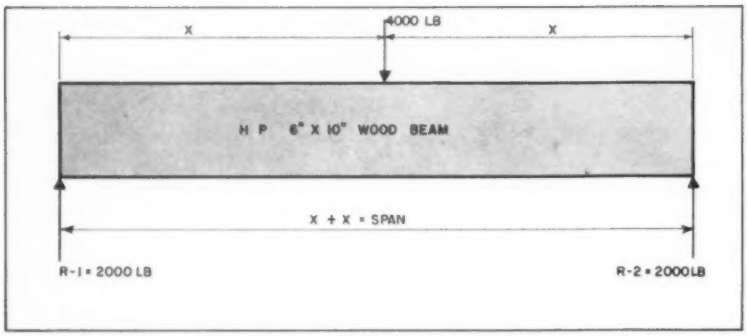


Fig. 3. Wooden beam carrying 4000 lb load. Find the maximum horizontal shear

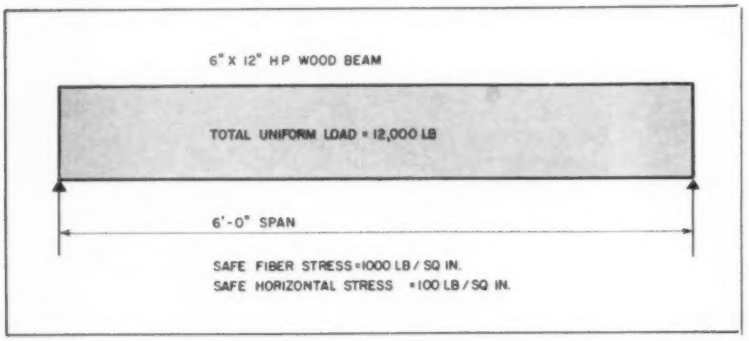


Fig. 4. Uniformly distributed load. Find the fiber stress and horizontal shear

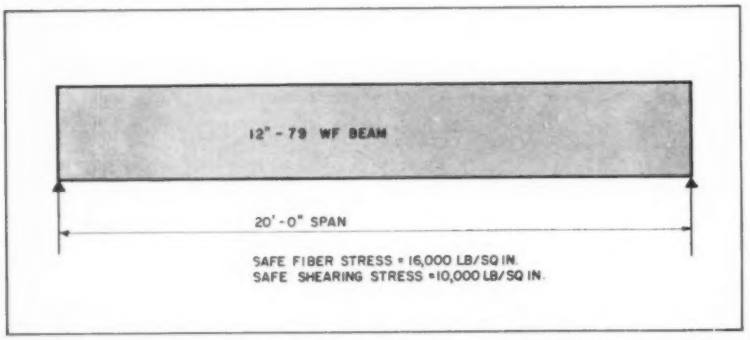


Fig. 5. Wide flange beam carries maximum uniform load. Find load, unit stress

6. S_h at outer fibers.
Since A = 0 therefore $S_h = 0$.

This example clearly illustrates that the unit vertical shear is equal to the unit horizontal shear and is maximum at the neutral axis, and zero in intensity at outer fibers.

The maximum horizontal and vertical shearing stresses are equal to 3/2 the average vertical shearing stress in a rectangular section of beam. Expressed as formula:

$$S_h = \frac{3\ V}{2\ bh}$$

where V = Vertical Shear
bh = Breadth and Height or Area
and $\frac{V}{bh}$ = Average vertical shearing stress

Problem: Simple beam, 6 in. by 10 in., carries a load of 4000 lb. Find the Maximum Horizontal Shear.

Data: Refer to Fig. 3.

Solution: V = R-1 = ½W = 2000 lb
A = 6 x 10 = 60 sq in.

$$\text{Then } S_h = \frac{3 \times 2000}{2 \times 60} = 50 \text{ lb}$$

The following example is presented to illustrate the theory that when the beam is less than ten times its depth, failure will occur by shear, while if it is longer than ten times the depth, failure will occur from bending stresses.

Problem: Assume a uniformly distributed load of 12,000 lb supported by a 6-in. by 12-in. beam, spanning 6 ft. Find the actual fiber stress and the horizontal shear.

Data: Refer to Fig. 4. Beam to be long leaf yellow pine with an allowable fiber stress of 1000 psi. Safe horizontal stress is 100 psi.

Solution:

$$\text{I of beam} = \frac{6 \times 12 \times 12}{6}$$

$$= 144$$

By substitution in formula solving for fiber stress:

$$\frac{12{,}000 \times 6 \times 12}{8} = 144 \times f$$

$$f = 750 \text{ psi}$$

Comparing this calculated figure with the safe fiber stress of 1000 lb, it is obvious that the beam is strong enough to carry the load.

$$S_v = 12{,}000/2 = 6000 \text{ lb}$$

$$\text{Area} = 6 \times 12 = 72 \text{ sq in.}$$

$$\text{Therefore } S_h = \frac{3 \times 6000}{2 \times 72} = 125 \text{ psi}$$

Comparing this calculated horizontal shear with the safe allowable shear, it is obvious that the beam is not safe and will fail. It should also be noted that the length of the beam is less than ten times the depth.

Shear in I-Beams

It is customary to assume that the I-beam flange carries all the fiber stress and the web carries the vertical shear. This is not exactly true, but is on the safe side and since the shearing value of steel is high, the web is amply able to take care of the shear.

$$\text{Vertical Shear in I-beam} = \frac{V}{td}$$

Where t = web thickness
d = depth of Beam

Problem: A 12-in., 79-lb wide flange beam carries its maximum uniform load on a 20-ft span. Find the load and the greatest unit stress.

Data: Refer to Fig. 5. Safe fiber stress of steel is 16,000 lb. Safe shearing stress is 10,000 lb.

Solution: From the tables of Properties of Sections in the AISC or Pocket Companion find the Section Modulus of this beam to be 107.1, web thickness (t) to be ½ in. and depth of beam (d) to be 12.375 in.

By substitution in the formula $\frac{W1^2}{8} = f \times \text{Sect. Mod.}$ solve for W

$$\frac{W \times 20 \times 12}{8} = 16{,}000 \times 107.1$$

$$W = 57{,}120 \text{ lb}$$

$$S_v = 57{,}120/2 = 28{,}560 \text{ lb}$$

$$\text{Avg.} = \frac{28{,}560}{12.375 \times 0.5} = 4600 \text{ lb}$$

The calculations show that the beam is safe since the average shear is below the allowable safe shear.

KELLER

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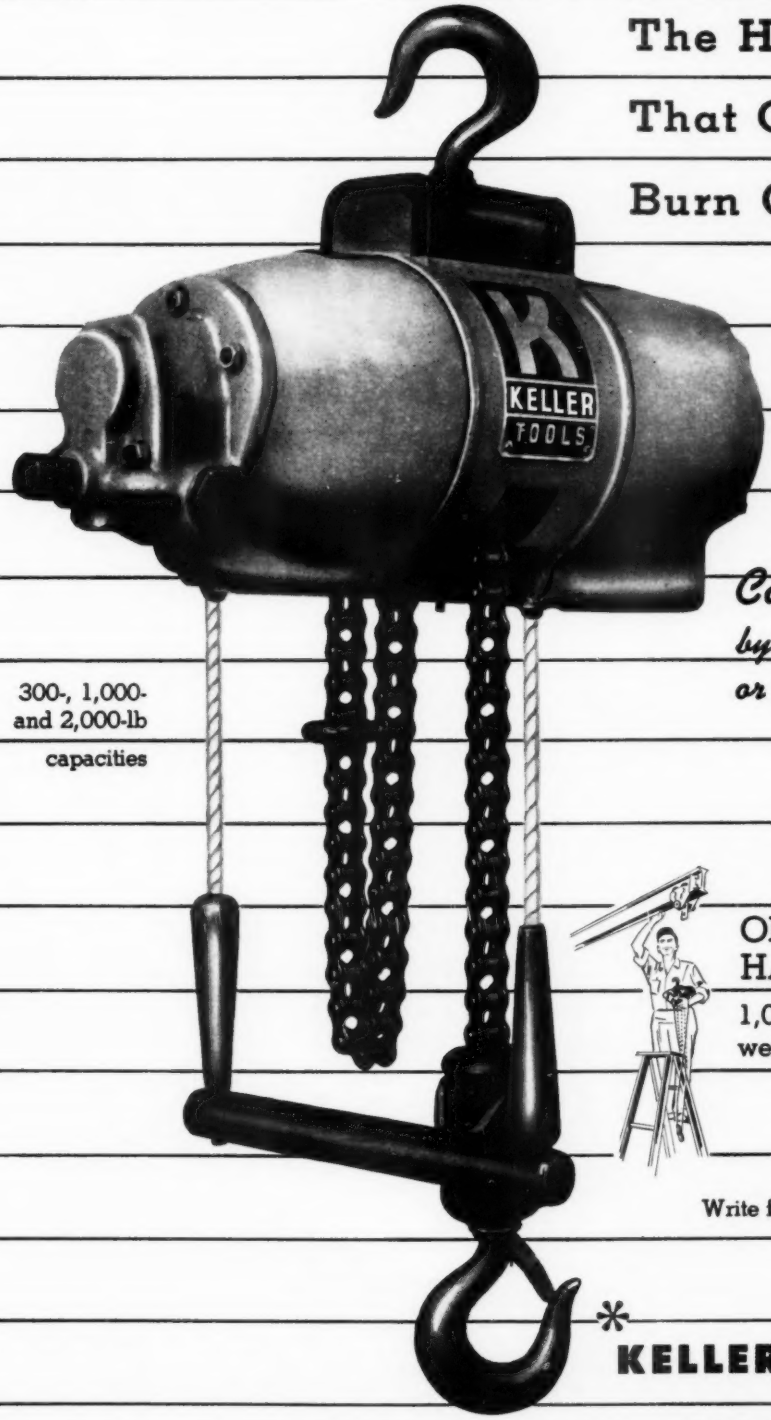

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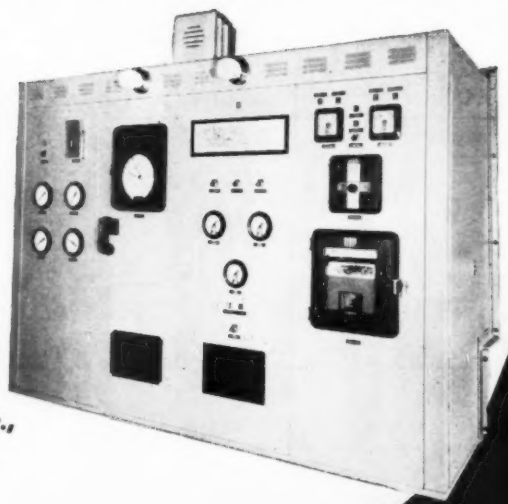

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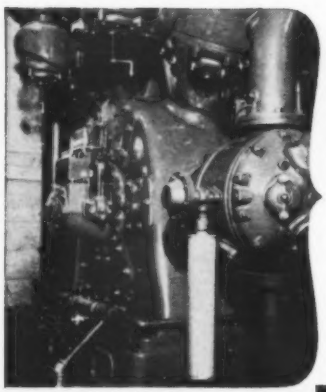

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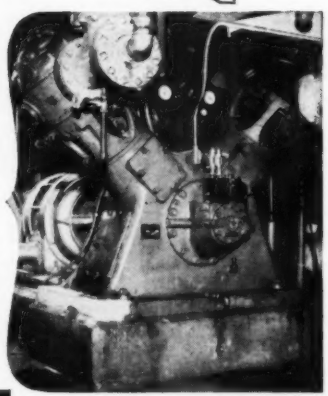
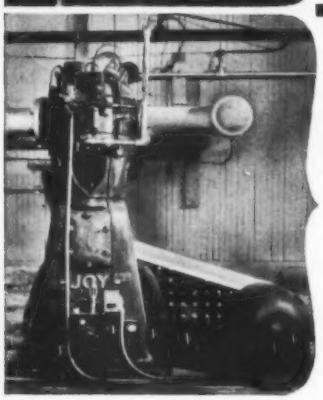
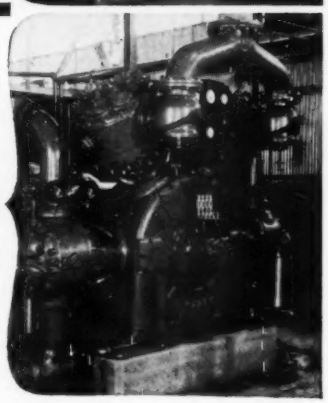


1947 Customer so impressed with WN-114's amazing record that he adds a WN-112 (two-cylinder, heavy duty, two-stage, 378 to 1838 CFM) Compressor for additional continuous duty. Confidence proves well-placed—WN-112 gives troublefree service from time of installation to present date.



1953 Following theory of staying with a winner, customer installs a Joy WG-9 (water-cooled, double-acting, heavy duty, single stage, 172 to 881 CFM) Vertical Compressor to furnish air for impact wrenches and other shop tools.

195? During construction of new power plant, customer pours concrete foundation for *another* Joy WN-114. This will be added when air requirements increase in expanded plant.



INSIST ON THESE QUALITY CONSTRUCTION FEATURES IN YOUR NEXT COMPRESSOR

- Honed, REPLACEABLE crosshead and cylinder liners.
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- Factory assembly and testing to insure permanent alignment.
- One-piece, box-type, tinned crossheads.
- Full force-feed lubrication.
- Precision crankpin and crosshead pin bearings.

Let us know the type and size of compressor in which you are interested. We'll rush free detail-filled bulletins. Write ***Joy Manufacturing Company, Oliver Building, Pittsburgh 22, Pa.*** In Canada: *Joy Manufacturing Company, (Canada) Limited, Galt, Ontario*

Consult a Joy Engineer

JOY

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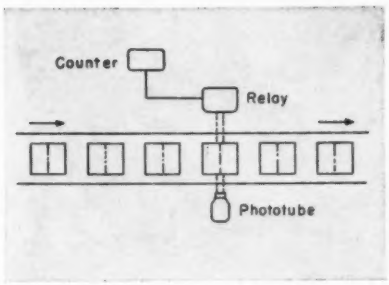
SINCE 1851—OVER A HUNDRED YEARS OF ENGINEERING LEADERSHIP

For more facts circle 566 on Reply Card

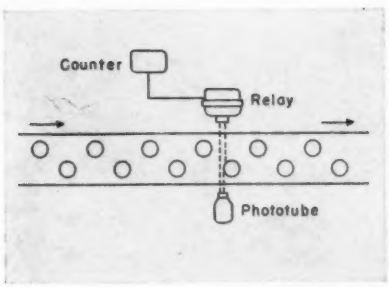
G-E Photoelectric Relays Sort, Count, Signal — Automatically



CR7505-K100

Simple, Inexpensive, Dependable

Ideal for applications not requiring extreme accuracy or extra high speeds, the K100 can relieve costly personnel for more productive jobs. A good example is the application at left, where this relay is being used to operate a counter on a conveyor line. The K100 is furnished in a sturdy NEMA Type I enclosure. *Bulletin GEA-3533D.*

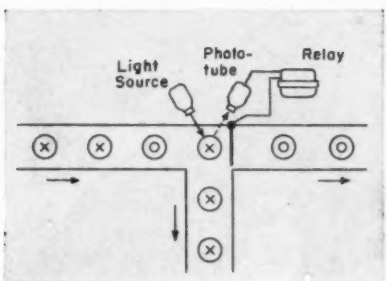


CR7505-K201

High-quality, General-purpose Relay

The K201 photoelectric relay, shown at left counting small cans on a high-speed conveyor line, offers sufficient sensitivity and operating speed for most applications.

The K201 is available in either weather-resistant and dust-tight (NEMA III and V) or explosion-proof (NEMA VII) or water-tight (NEMA V). *Bulletin GEA-5920.*



CR7505-N210

High Speed, High Sensitivity

The N210 relay is an extremely sensitive device designed for operation at very high speeds.

In the example shown here, it is used on a conveyor to separate cans according to markings. It can also be used to sort unlabeled cans from correctly labeled ones. Available in same enclosure types as K201. *Bulletin GEA-5921.*

SPECIFICATIONS

Maximum operating speed:

K100: 150 per minute
K201: 450 per minute
N210: 600 per minute

Maximum operating distance:

K100: 30 feet
K201: 70 feet
N210: 210 feet

Sensitivity*:

(Minimum light intensity at phototube for successful operation)

K100: 40 fc.
K201: 3 fc.
N210: 1 fc.

* Depending on combination selected.

High contact rating

Can start f-hp motors directly, and operates all a-c motor starters through NEMA Size 4, without additional relay. Meets all NEMA standards.

ELECTRONIC TIMER CR7504-A142

Handles timing over three ranges. .06-1.2, .6-12, 6-120 seconds. Highly accurate, versatile. *Bulletin GEA-5255.*

ELECTRONIC RELAY CR7511-A126G2

A versatile new relay which operates wherever there is sufficient change in circuit resistance. *Bulletin GEA-5893.*

FOR MORE INFORMATION, contact your nearest G-E Apparatus Sales Office or authorized G-E distributor, or write General Electric Company, Section H 785-8, Schenectady 5, New York for the following bulletins:

- ☐ GEA-3533D, Photoelectric Relay K100
- ☐ GEA-5920, Photoelectric Relay K201
- ☐ GEA-5921, Photoelectric Relay N210
- ☐ GEA-5255B, Electronic Timer
- ☐ GEA-5893, Electronic Relay

NAME ..... TITLE .....

COMPANY .....

ADDRESS .....

CITY ..... STATE .....

ELECTRONIC DEVICES

GENERAL ELECTRIC

For more facts circle 567 on Reply Card

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to steam trap problems

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YARWAY IMPULSE STEAM TRAP . . .
the steam trap that gets equipment *hot in a hurry and keeps it hot.* Small size, light weight, *body and all working parts of stainless steel.* Low cost, low maintenance.

YARWAY FINE SCREEN STRAINER . . .
with high-grade woven Monel wire screen that is removed with the cap for easy cleaning. Rust-proof finish . . . straight threads, machined faces and spark-plug type gaskets on screen caps.

YARWAY ENGINEERING SERVICE . . .
32 trained YARWAY engineers working out of YARWAY branch offices from coast-to-coast, are constantly helping on *trap selection, installation maintenance* and *operation.* Solving your trap problems is their job. It will cost you nothing to call them in to assist you.

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• YARWAY IMPULSE STEAM TRAPS AND STRAINERS are immediately available from more than 250 Industrial Distributors in the United States, Canada, and other countries. For name of one nearest you and FREE Steam Trap Bulletin write . . .

YARWAY

impulse steam traps

And Yarway Fine Screen Strainers

For more facts circle 568 on Reply Card

To prevent contamination of the product and to reduce corrosion, Atlantic Gelatin is increasing its use of reinforced plastic in process equipment and piping . . . To date, it has been used as a lining for several tanks, for repairing pipe leaks and in fabrication of piping, necessary fittings

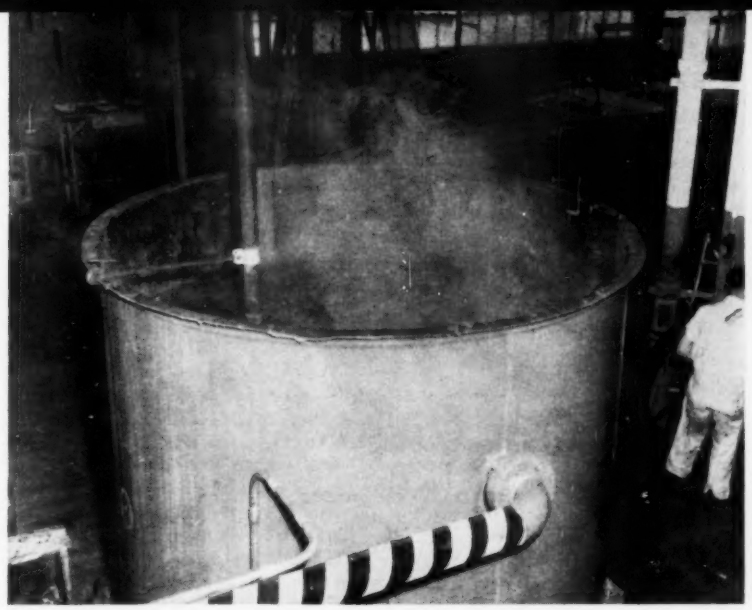


Fig. 1. Reinforced plastic was used to line this 1,500 gal steel hot water storage tank. The tank was laid on its side while the lining was being applied

Here's How Reinforced Plastics Are Put to Work at General Foods

By BROR J. GRONDAL, Engineering Department, Atlantic Gelatin Div., General Foods Corp.

IN THE MANUFACTURE of gelatin and recovery of by-products at Atlantic Gelatin Division, we encounter many corrosive conditions. To prevent contamination of the product and to reduce corrosion, we use large quantities of such construction materials as stainless steel, aluminum and glass. Recently, we have been increasing the use of reinforced plastics in process equipment and piping since plastics are less expensive and often more resistant to chemical attack.

Unfortunately, many plastics are not recommended for use at temperatures above 175 F. Polyester-Fiberglas laminate, however, is one of the few plastic materials which withstands temperatures in excess of 300 F, can be formed at low pressure, and cured at room temperature.

Reinforced plastics are made up of continuous filaments of glass bound together with thermosetting resins.

The least expensive and yet a very useful form of fibrous glass is roving, which consists of 60 ends of continuous twisted strands wound in a ball.

One of our first uses of reinforced plastic was as a lining for a 1,500 gal steel hot water storage tank in our ion-exchange installation. The internal surface was rusty and uneven because of many years' service in grease storage and alterations by welding.

It is an axiom in the protective coating business that the adherence of the coating is no better than the surface cleaning job. In this case, the inside surface was prepared by soaking and thorough washing with strong soap and hot water to remove grease. This was followed by a brisk brushing with steel wool to remove loose rust. Tight clinging rust was left on to provide a better grasping surface for the resin.

Lining Procedure

The first step in lining the tank was the application of a liberal coat of resin to the dry, clean interior. While this was still tacky, one layer of Fiberglas cloth, cut to shape, was applied and smoothed on firmly. Another coat of resin was applied immediately to saturate the cloth and bond it firmly to the undercoat. After several hours when this had hardened a last seal coat of resin was applied for smoother finish and improved protection.

The Fiberglas cloth was plain woven type 1000, 42 in. wide. Strips cut to fit the round tank bottom had two inches overlap and extended up the straight sides six inches. The sides were covered with vertical strips which extended from the bottom of the tank up and over the top flange. The inside of the bottom outlet pipe and the face of the bottom flanges were similarly covered with resin and glass cloth. Side connections for thermometer and gage glasses were made of stainless steel pipe which extended into the tank where they were sealed to the lining.

While the lining was being applied, the tank was laid on its side and rolled along to suit the convenience of the plant pipe coverer who did the work. He used a piece of light gage shim stock, 3 by 6 in. with rounded corners to smooth out he glass cloth while sticking it to the tacky resin surface. A portable fan was used to direct fresh air into the tank as he was applying resin to remove styrene vapors which have a typical gassy odor. This tank has been in continuous service for nine months and its lining is in good condition. See Fig. 1.

Similarly, the interior of a steel salt truck which had been considerably thinned and weakened by corrosion was cleaned and covered with reinforced plastic. This strengthened the truck, giving it a smooth corrosion-resisting surface along which the salt flows readily.

A useful application of polyester resin and glass cloth is in the rapid repair of leaks or breaks in pipe lines. Such repairs are most helpful at inconvenient places where welding is awkward or impossible and where it would be necessary to take down a

considerable part of the line to replace the leaking section or fitting. We employ the following procedure on pipe lines in hot or cold water, corrosive liquids, sewer drains, and low pressure steam service:

1. Shut off service on the line. As soon as the leak stops dripping, the patch can be applied. If this does not suffice to stop the flow, further action to accomplish this is necessary. For instance, you might break a union or flange upstream in the line to drain away the fluid, disconnect the line which is the source of the liquid, or use any temporary method of stopping the hole—with a wooden plug, putty held in place with friction tape, or binding tightly with electricians' tape or sheet rubber. Occasional drops can be tolerated while applying the patch, but continuous flow washes liquid resin from the glass cloth, and the patch will not be tight.

Resin Formula

2. Clean the pipe six inches either side of the leak, removing grease and dirt with soap and hot water. Steel wool or a coarse rasp will remove loose rust and paint, but it is not necessary to go down to bright metal.

3. Prepare the resin in a disposable container such as a can or paper carton. A typical formula is polyester and styrene mixed well with 2 per cent catalyst paste and from 2 to 5 per cent accelerator. The 2 per cent accelerator formula hardens in one hour, while the 5 per cent formula hardens in 20 minutes.

Then brush the resin formula over the cleaned area of the pipe generously going around the pipe and six inches on both sides of the leak. Wrap Fiberglas tape, 1½ in. wide or wider, depending upon the pipe diameter, or Fiberglas cloth cut into strips around the pipe and for the length, wet with resin. It is important that the Fiberglas be wrapped tightly with about one-half width overlap. The end of the tape should be kept tight by splitting and tying or by wrapping with cord. Resin formula is then brushed into the layer of tape until it is well saturated. In like manner, at least two more layers of tape are wrapped tightly, each layer saturated with resin. Finally, the taped area is bound with glass cloth kept tight with string or glass rovings and saturated with resin.

4. If the ambient temperature is 70 F or over, this patch will be hard and ready for service in from 20 minutes to an hour after the last resin is applied. If down to freezing temperatures prevail, it may take several times as long for the patch to harden. In any case, hardening may be hastened by warming with a hot blast or with an infra red lamp, taking care that the resin does not become overheated since this will cause it to lose viscosity and drain out of the Fiberglas leaving voids.

Our first use of this technique was in repairing a leak in the bottom of a Y in a four-inch all welded steel drain line. The pipe was so thin and corroded in the area of the leak that welding merely enlarged the hole. This was a rather awkward place to apply a first patch, but the clumsy patch held tight from the start and has given 10 months' satisfactory service. Later, the entire line, consisting of five branches, was entirely covered with three layers of Fiberglas cloth and resin. There have been no further pipe leaks, although in that time five cast iron gate valves failed and were replaced. In this case, it is possible that the laminated temporary patch will serve as a tight drain line long after the steel pipe is corroded away.

Kits which contain all materials necessary for repairing leaks or breaks in piping are now available. More information on these kits is mentioned in the boxed item on this page.

Fabricating Pipe

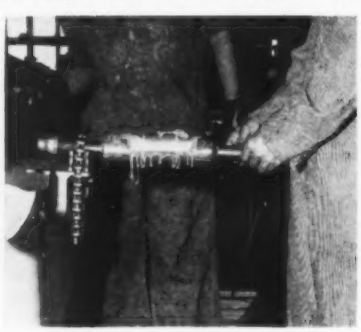
It is not a great step from extended reinforced plastic patches to pipe and fittings constructed entirely of this material. When the drop lines from the gelatin kettles to the receiving tanks were replaced last summer, aluminum pipe was used for one half and reinforced plastic in the other.

You can see a close-up view, Fig. 2, of the elbows and tees made by mitering pipe and wrapping the joints with glass cloths saturated with resin. Straight pipe was joined in the same manner.

Flanges were made of layers of Fiberglas mat cut to shape, saturated with resin and hardened in the steel mold under pressure as shown in Fig. 3. Bolt holes were drilled out. The hole in the flange was tapered slightly with the diameter decreasing from hub to face of the flange. A matching taper was turned on the end of the pipe inserted into the flange hole. Polyester resin was used as the adhesive in this tapered joint. Rovings saturated with resin were wound around the pipe and hub of the flange to improve and strengthen the joint.

The assembled lines and fittings were tight when tested by the manufacturer with cold water at 165 psi.

Hole in Pipe is Mended with Glass Tape, Cloth and Resin — In 45 Minutes



Repairing a leak in a broken pipe can be a simple job with the use of a pipe repair kit. These illustrations show the necessary steps in making repairs. The large hole shown in illustration at left is first covered with a stiff sheet of impregnated Fiberglas to restore the contour of the pipe. In the center illustration, the pipe surface, then the hole covering, are heavily coated with resin. In the illustration at right, Fiberglas tape, saturated with resin, is wrapped around the hole. To speed curing, Fiberglas mat, also saturated with resin, can be wrapped over the tape. After curing, which requires about 45 minutes, the pipe is ready for service. If you are interested in getting more information on this handy repair kit, kindly write the Editor, Plant Engineering, 110 South Dearborn Street, Chicago 3, Illinois

Fig. 2. View shows elbows and tees made by mitering pipe and wrapping joints with glass cloth saturated with resin

Fig. 3. Flanges made of layers of Fiberglas mat were soaked with resin, hardened in steel mold under pressure

When the completed line was installed at our plant and pressure tested with hot water, one of the tapered joints between flange and pipe developed a large leak. This joint was cleaned and set again with resin. After the installation, five more joints between pipe and flange failed, indicating that these joints are the weakest part of the installation. All pipe, elbows, tees, joints and the face-to-face flange connections have not leaked and show no corrosion or wear.

Lessons of First Installation

In the manufacture of the flanges, it was necessary to use wax as a mold release on the steel. Not all wax was removed, causing a defect in the joint so that it failed under hot water and steaming out conditions. An improved joint between pipe and flange is now being used that has overcome this difficulty.

From this initial installation, it was learned that polyester pipe must be supported more closely than metallic pipe, especially where the weight of drop lines, valves, or branch lines must be borne by the main line. Under continuous load at elevated temperatures, reinforced plastic acts in a manner similar to glass and deflects slowly. Where a dip has occurred, the pipe can be straightened by putting in an adjustable support. The pipe can then be raised a small amount each day and so restored to its original position.

Since the first installation, Atlantic Gelatin's maintenance department has fabricated and installed a rather complicated dilute acid drain line from two new wooden tanks installed to recover grease. Four-inch reinforced plastic pipe was purchased from a regular supplier. All fittings were made here at Atlantic Gelatin and flanged to Saran-lined valves.

Figure 4 shows a tee made for this installation. A four-inch hole was made in the top of the horizontal pipe with a hole saw. The end of the vertical pipe in the tee was cut to shape on a band saw and tacked in position with a single layer of cloth saturated with resin. The joints were later sealed with four layers of glass cloth and rovings wet with resin.

The design of the flange mold was altered to reverse the taper of the hole in the flange, so that the diameter increases from hub to face. To attach pipe to this flange, 1/16 in. of roving and resin are first wound around the outside of the pipe for a distance extending one-half inch from the end to form a strong bead. When this hardens, more rovings wet with resin are wound around the end and tapered roughly to fit the flange.

While this second layer is soft, the pipe is forced into the flange until the end is flush with the face of the flange. This gives a compression joint between pipe and flange having good strength. Additional rovings are wrapped on the hub of the flange and pipe to lock the flange to the pipe. A cross-section of this joint is shown in Fig. 5. There have been no failures of this method of attaching pipe to flange.

These are some of the services which reinforced plastic laminates are performing at Atlantic Gelatin Division.

Fig. 4. These tees were made in the four-inch reinforced plastic pipe and sealed with four layers of glass cloth and rovings wet generously with resin

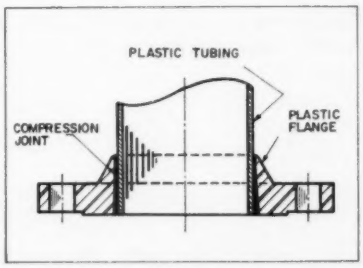


Fig. 5. Cross-section of a compression joint between the pipe and flange gives added strength. Additional rovings are wrapped on the hub of flange and pipe

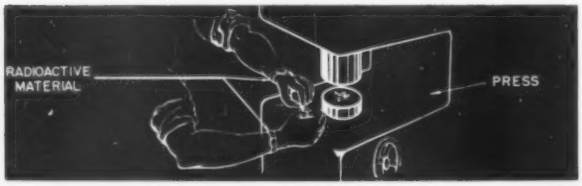
INDUSTRIAL ISOTOPES— A Review of Their Uses

While ninety per cent of the spotlight has been shining on the H-bomb, the A-bomb and atomic power developments, a new tool has been making strong impressions on industry . . . This is the isotope, a radioactive element

PRESENTED in the capsules below, and on the opposite page, are some uses to which the isotopes of several elements have been put. Some of them are jobs which have never before been done satisfactorily. Others are improvements on practices which had hitherto been performed in other ways and with other tools. All of them, perhaps, may point out to plant engineers in many industries how they too can put one of man's best friends to work.

If you want to keep up to date on the latest developments in the practical application of atomic energy, and you would like these developments explained in easy terms, we would be happy to place your name on our mailing list to receive "Atomics," the periodic news letter written by A. W. Kramer, member of the Advisory Committee to the Atomic Energy Commission. There is no charge for this service.

In addition, if you want more information about any of the applications shown here just let us know. We have prepared mimeographed sheets explaining the procedures. In either case, drop a line to the editor, telling us what you would like and we will take care of it promptly.



Punch Press Operator Safety

ADVANTAGES:

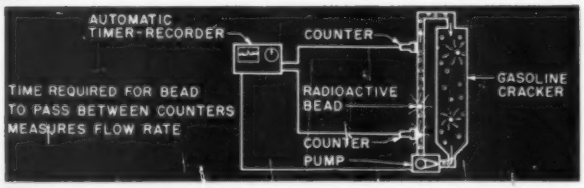
1. Machine cannot be started unless operator wears wrist bands
3. If bands approach too near dangerous area of machine it stops, even in mid-stroke

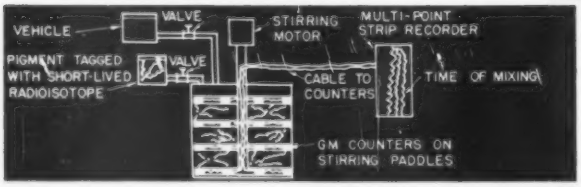
Radioactive Beads

For Controlling Catalyst Flow Rate

ADVANTAGES:

1. Improper operation indicated at once
2. No interference with production
3. Flow may be adjusted automatically





Radioactive Isotopes

For Measuring Uniformity of Paint Mixing

ADVANTAGES:

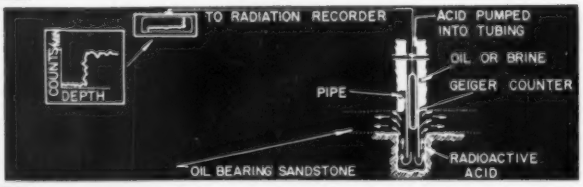
1. Yields continuous mixing data
2. No interference with normal mixing
3. Gives design data for better mixers

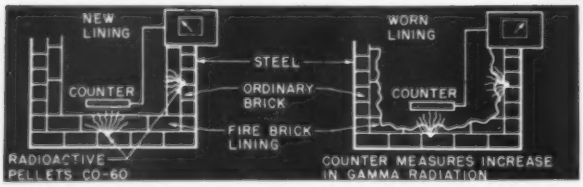
Radioactive Isotopes

For Control of Oil Well Acidizing

ADVANTAGES:

1. Increases oil production efficiency
2. Saves time and money
3. Less hazardous than removing pipe





Radioactive Cobalt 60

For Measuring Firebrick Lining Wear

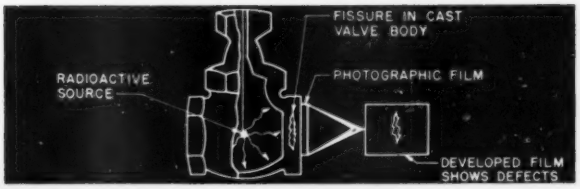
ADVANTAGES:

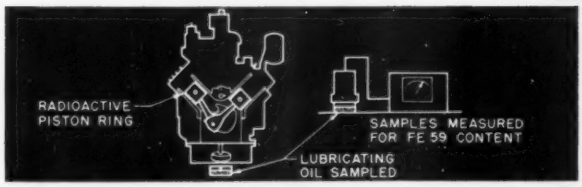
1. Permits non-destructive testing
2. Measures wear in several locations
3. Normal operation while testing

Radioactive Cobalt
For Radiography Testing

ADVANTAGES:

1. Versatile and reliable inspection
2. Inspection without dismantling
3. High activity at low cost





Radioactive Iron – Fe59
For Friction and Lubrication Studies

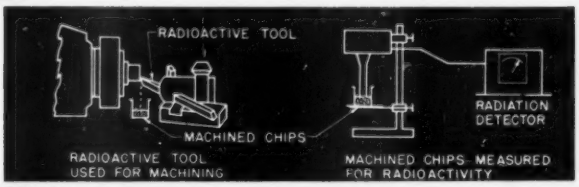
ADVANTAGES:

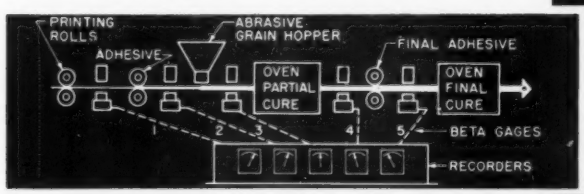
1. Gives metal transfer to 0.000001 oz
2. Oil sampled during operation of motor
3. Film shows location of wear

Radioactivity Tests
Measuring Cutting Tool Wear and Life

ADVANTAGES:

1. More sensitive than other tests
2. Faster and more efficient
3. Yields knowledge of wear process





Multiple Beta Gages
For Measuring Product Thickness

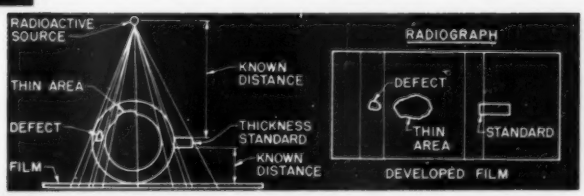
ADVANTAGES:

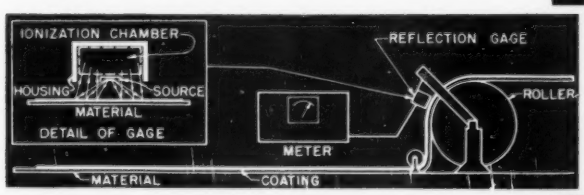
1. Improves quality control
2. Measures variety of materials
3. Measurement is continuous

Radioactive Isotopes
Measuring Thickness and Defects in Castings

ADVANTAGES:

1. Versatile and reliable inspection
2. Inspection without dismantling
3. High activity at low cost





Radioactive Source
For Reflection Thickness Gage

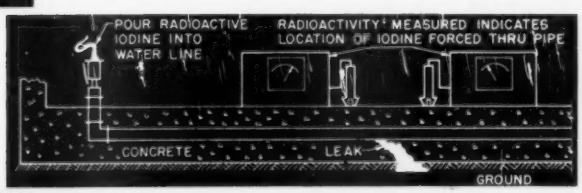
ADVANTAGES:

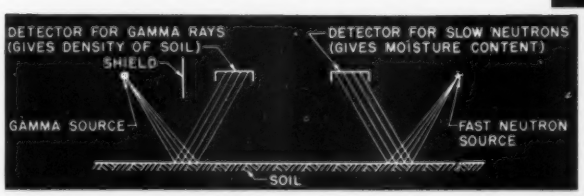
1. Measures coating and/or material
2. Can measure from one side only
3. Many materials with one calibration

Radioactive Iodine – 1.131
For Detecting Leaks in Water Lines

ADVANTAGES:

1. Not necessary to remove floors
2. Less costly and more convenient
3. No residual activity





Density and Moisture in Soil
This Data Important in Road Building

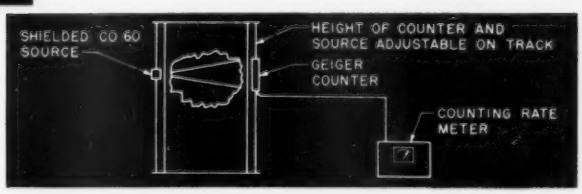
NOTES:

1. Data obtained without moving soil
2. Gamma ray detector measures density
3. Slow neutron detector shows moisture

Radioactive Cobalt – Co60
For Indicating Liquid Level

ADVANTAGES:

1. Unaffected by corrosion, temperature
2. Used by non-technical personnel
3. Automatic recording and control



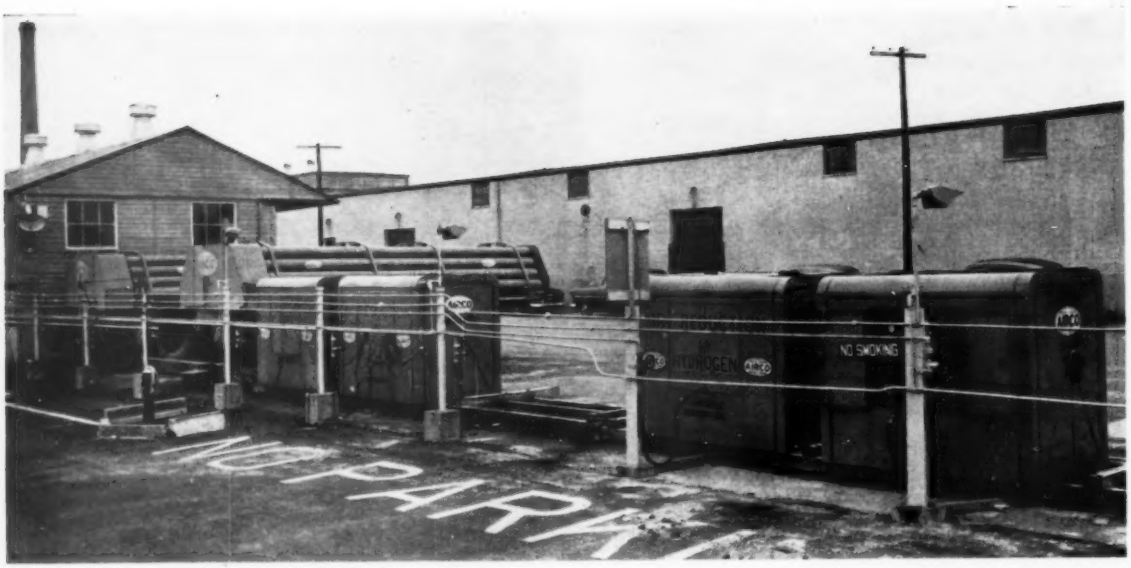


Fig. 1. Gases from trailers and Dempster-Dumpster units flow through pipes in foreground to pressure reduction stations

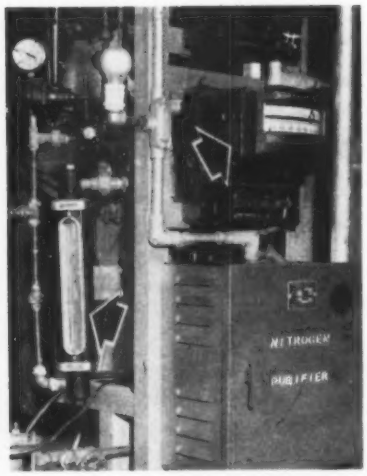


Fig. 2. Flowmeter, purifier pyrometer

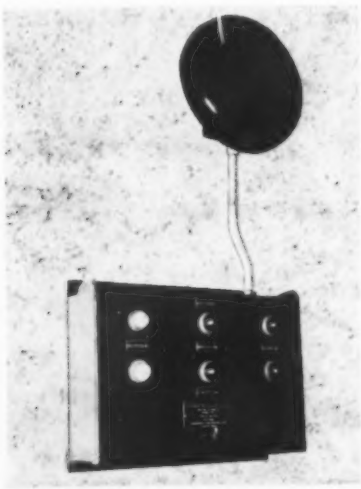


Fig. 3. Oxygen-nitrogen warning panel

Gas System Engineered For Safe Service

Compressed gases from bulk units go underground...Piping uses protective devices

GASES SUCH AS HYDROGEN, oxygen, nitrogen and argon are important ingredients in the manufacture of incandescent lamps at Sylvania Electric Products Inc. plants. To keep an adequate and flexible supply of gases on hand consistent with economy, the firm has turned to centralized bulk storage located away from the main plant buildings. Supplies usually are replenished automatically at a frequency based on an established use factor.

For example, the Loring Avenue plant in Salem, Mass., has been receiving bulk supplies since 1944. Here, the bulk station has equipment to handle six Dempster-Dumpster units in addition to three large multiple cylinder trailers, Fig. 1.

Normally the units operate in pairs. One is kept in reserve while the other is in service. Tags, which are hung on valves to show the status of a unit, have been provided in the building housing the pressure reduction stations. See Fig. 5.

Regulators on the two units working together are set with a pressure differential between them. This is done so that the reserve unit is cut into the line automatically as soon as the manifold pressure drops below the regulator pressure of the reserve unit.

After a fresh unit has been delivered to the bulk station by the supplier to replace one that has been depleted, regulators are re-set to take care of the change. The reserve unit that has been feeding gas to the plant is placed in a service status. To make this possible, its regulator pressure is manually raised so that it is above that of the reserve unit regulator setting.

Gases flowing from these bulk units are routed through the pressure reduction building where the pressure is reduced considerably before it continues underground on its way to the plant. Figure 5 presents a typical reduction station. A block wall separates the area from the neighboring station used for oxygen. The other three walls have outside exposure. Hydrogen leaves this station at a pressure of about 15 psi and oxygen at a somewhat higher pressure.

In the case of hydrogen, when production demands are somewhat reduced, this gas is delivered in standard cylinders.

Regulators used with the hydrogen cylinders are of a two stage type with an intermediate pressure reduction

Fig. 4. Truck is specially equipped to handle bulk units

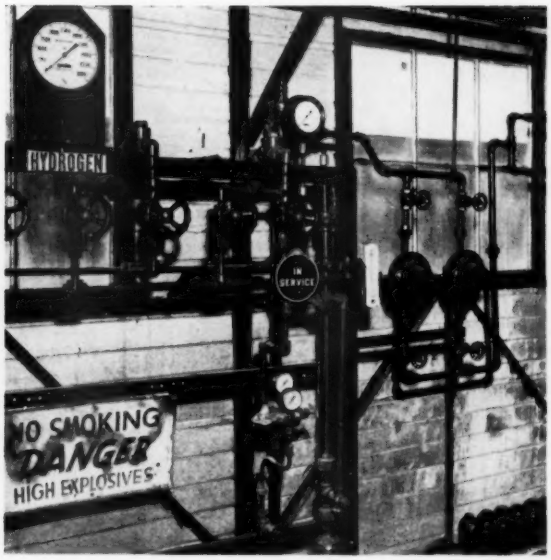


Fig. 5. Gas pressure reduction station in an isolated building

stage. This design prevents gas at cylinder pressure from rushing into the plant service lines in case the regulator fails. An inrush of high pressure gas causes a disc to rupture and gas is exhausted to the atmosphere. The isolated location of hydrogen supplies would make it relatively safe in the event of such an occurence.

A vitally important feature incorporated in the piping for hydrogen is that of using fire checks to prevent flash-backs in case of a plant fire. High-low alarms warn personnel in the plant when hydrogen leaks develop.

After hydrogen enters the plant it is distributed through overhead piping to the sintering furnaces. The gas is then used in the heat treating of tungsten filaments to improve their life. See Fig. 7.

Oxygen is used to enrich the natural gas flame on the sealing-in machines. Nitrogen flushes the inside of the bulbs and also serves as a fill along with argon. Before any of these gases reach the production units their flow is directed to distribution stations such as the one shown in Fig. 6. This particular one takes care of nitrogen and argon. In some cases sub-distribution stations are used.

Before use, nitrogen and argon are diverted through a purifier where any oxygen is removed. This is done by passing the gas over heated copper tubes in a furnace. Figure 2 shows a nitrogen purifier control panel and pyrometer. The copper reacts with the oxygen to form copper oxide. Under controlled conditions, hydrogen is passed over the tubes to deoxidize them and they are then ready to start additional gas purification.

The purification system includes a purity recorder which is designed to continuously check the argon and nitrogen after it leaves the furnace. An alarm is included in the unit to indicate when something has gone amiss.

In case of leaks in the plant involving oxygen and nitrogen, visible and audible alarms are used, see Fig. 3. Even so, lines and equipment are periodically subjected to leak tests with soapy water and glycerine. Sections of piping are isolated for test by using valves installed in the system for this purpose. During the leak test, piping must hold a pressure of 60 psi for 12 continuous hours. During repairs or in the case of sudden leaks developing in the system, auxiliary feed stations are set up to take care of the situation until the emergency has passed and normal supply is restored.

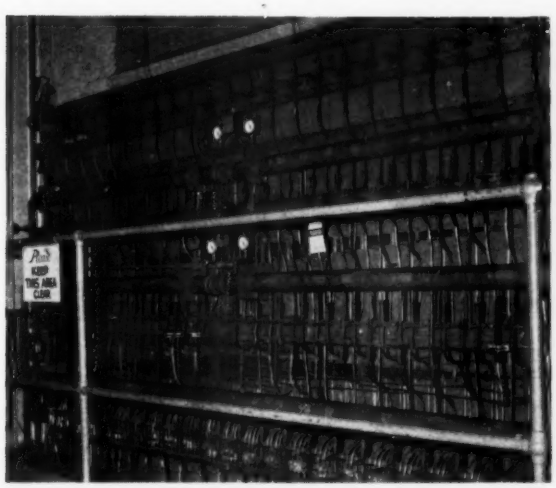


Fig. 6. Argon, nitrogen manifolds at a distribution center

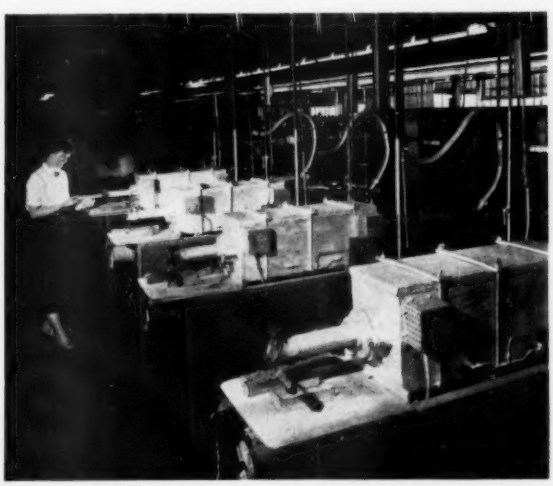


Fig. 7. Plant piping carries hydrogen to these furnaces

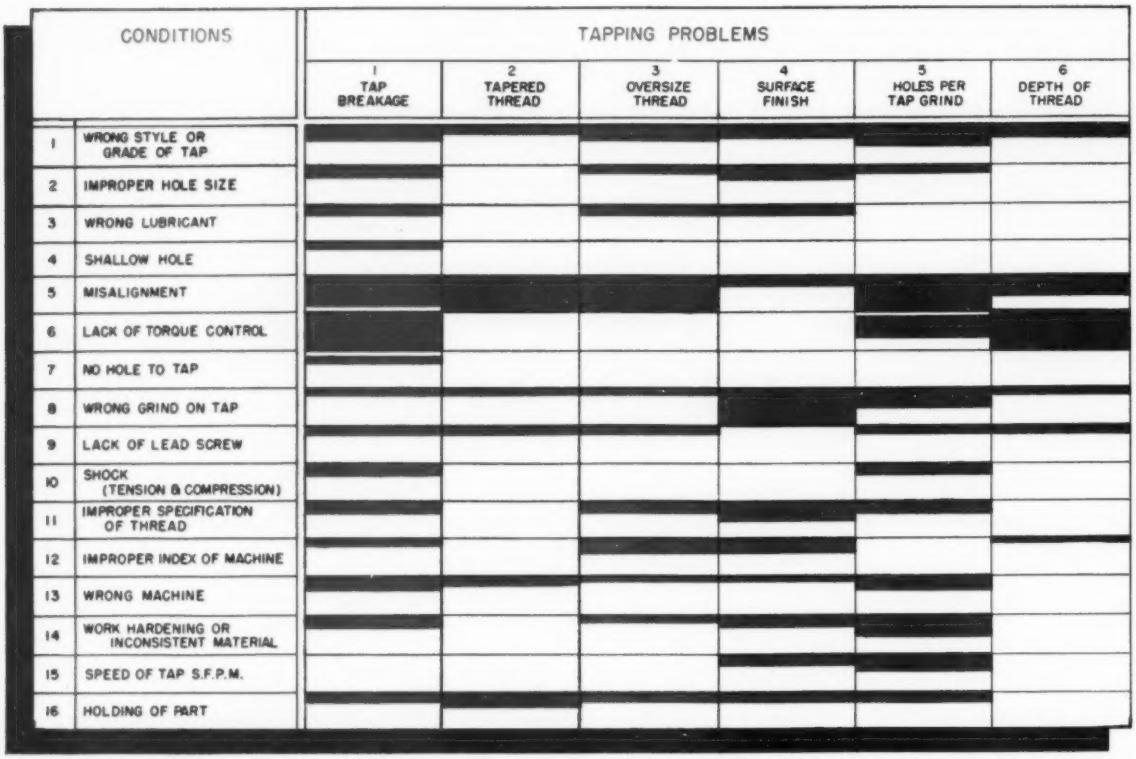

CONDITIONS
TAPPING PROBLEMS
1 TAP BREAKAGE
2 TAPERED THREAD
3 OVERSIZE THREAD
4 SURFACE FINISH
5 HOLES PER TAP GRIND
6 DEPTH OF THREAD
1 WRONG STYLE OR GRADE OF TAP
2 IMPROPER HOLE SIZE
3 WRONG LUBRICANT
4 SHALLOW HOLE
5 MISALIGNMENT
6 LACK OF TORQUE CONTROL
7 NO HOLE TO TAP
8 WRONG GRIND ON TAP
9 LACK OF LEAD SCREW
10 SHOCK (TENSION & COMPRESSION)
11 IMPROPER SPECIFICATION OF THREAD
12 IMPROPER INDEX OF MACHINE
13 WRONG MACHINE
14 WORK HARDENING OR INCONSISTENT MATERIAL
15 SPEED OF TAP S.F.P.M.
16 HOLDING OF PART

Fig. 1. The thicknesses of the colored horizontal bars indicate comparative effects that conditions have on problems

To Lick Manufacturing Problems Study List of Conditions

Chart helps to analyze problems quickly . . . Author explains its use in this article and offers some remedies

By HARRY CONN, Chief Engineer, Scully-Jones & Co.

THERE are three actions involved in solving any manufacturing problems; they are: (1) Defining the problem accurately; (2) Analyzing the conditions that can cause the problem; (3) Acting upon the deductions of analysis.

It has been said that 90 per cent of the work involved in the solution of any problem is in properly defining the problem. As an example, we will list the problems of tapping in the order of their most frequent occurrence: (1) Tap breakage; (2) Tapered thread; (3) Oversized thread; (4) Surface finish of thread; (5) Holes per grind; (6) Depth of thread.

These six problems constitute about 98 per cent of the difficulties encountered in tapping. Please note that they are problems and not conditions; problems are usually a result of conditions.

In tapping there are many factors and conditions that are inter-related to several of the problems commonly encountered. A list of conditions and the problems they breed, is shown in Fig. 1.

One of the most important steps or aids in solving any problem is to have a sound appreciation of the problem. Figure 1 lists six problems in the vertical columns and 16 conditions of tapping listed horizontally. The way to use this chart is to find the specific problem in one of the six columns and then find, directly beneath the column title, the condition that is the most responsible for the problem. The degree that the condition is prevalent and a guide to its incidence is shown by the depth of the color band. The proper approach to your problem is to properly define it, then look in the column under that heading and investigate the condition that has the deepest band.

If, after investigation has shown that the most prevalent condition is not the offender, the next widest bands should be investigated in their proper order. A chart like this can be compiled for any problem.

Brief mention is made of the significance of some of the conditions on the chart although an article could be written on each of them. Take, for example, item No. 7, No Holes to Tap. This problem develops in transfer machines, and several other high production machines. Drills are improperly adjusted after they are changed. When the machine goes

through its cycle the drills hit the piece part on rapid traverse and the drills break. Then, when the machine indexes the tapping heads, the taps try to tap a hole that isn't there.

There are three remedies for this condition. The first is to pre-set the drills outside the machine so as to eliminate in-the-machine adjustment. The second is to have inspection probing stations that will shut the machine off if the hole isn't there or if it isn't deep enough. Third, the tapping heads can have a telescoping action incorporated into the tap holders.

Tapered threads are usually the result of a misalignment of the tap with the hole. Condition No. 5, Misalignment, is the product of many factors and variables such as spindle runout, tap shank tolerance, index error, fixture design, expansion and contraction of machine drill head and bushing plates due to heat, concentricity factors in the spindle, holders and tap. This condition must be alleviated before accurate threads can be tapped. The condition must also be remedied to assure an accurate control of tapping torque, because when a tap misalignment condition is remedied it will frequently reduce the required torque by 25 per cent.

Floating Tap Holder

The most acceptable remedy for this condition is a floating holder. A floating holder to be efficient must have the driving element divorced from the floating element as shown in Fig. 3.

When a lathe turret is worn so that it is out of line or lower than the center-line of the spindle some means must be used to align the tap with the hole. A floating holder is the surest and most economical way of doing this and it must have a parallel float not an angular float.

In Fig. *2* is shown a tool that can remedy many troublesome tapping conditions. This tool is the answer needed when trying to remedy the conditions listed in items 4, 5, 6, 7, 10, 12, and 13. This holder will release the driving torque when 50 per cent of the breaking strength of the tap has been exerted. This tool will reset itself when the spindle is reversed and will back the tap out of the hole. It will then reset itself when the spindle is reversed for tapping. Floating action enables tap alignment in horizontal or vertical operations. The device provides a remedy for item 5 in all six problems.

If the hole has been drilled ¼ in. too shallow the tap will hit the bottom of the hole and release and the driver will telescope into the spindle and then return when the tap reverses and returns.

The nut which is fastened to the

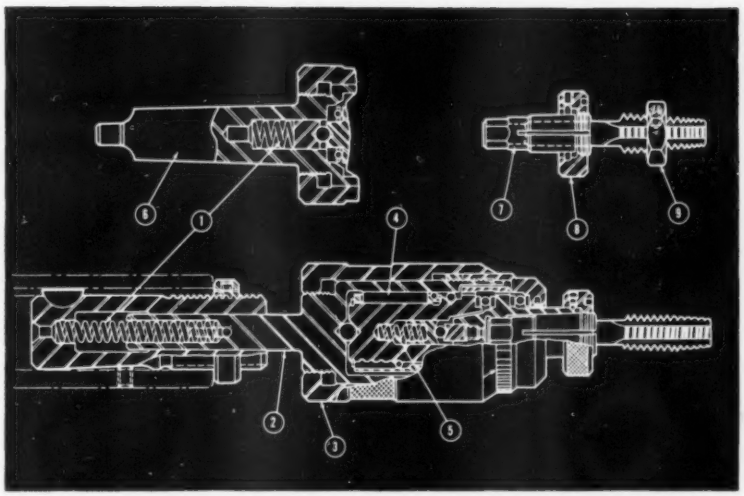


Fig. 2. Bad tapping conditions can be eliminated with a tap driver of this design

taper pipe tap, detail 9, in Fig. *2*, will enable the operator to control the turns or depth of pipe threads with exactness. The nut will hit the end of the work and the torque will build up to a releasing value.

The various sizes of taps may be inserted into the holder by obtaining the correct size tap chuck, detail *7*. The tap is removed by turning the collar, detail 8. It is interesting to note that there is no tang slot to enable the operator to use a drift and hammer for tap removal. This type of holder is designed for a definite range of tap sizes.

The torque may be adjusted by turning the collar, detail 3, which has a tapered inside diameter that corresponds to the tapered O.D. of detail *2*. Changing their lateral relationship results in a clearance between details 3 and *2*. The shell-like surface exerts the torque on the rollers, see detail 4.

The rollers, detail 4, drive the inner spindle which holds the tap. They will cause the shell-like portion of detail *2* to expand when the torque reaches 50 per cent of the breaking strength of the tap, thereby releasing the power.

A few words of explanation may be in order at this point to explain item 13. It isn't uncommon to see a radial drill operator tapping ¼-20 holes in the morning and later the same day in the same machine, tap 1-8 holes. The torque required for ¼-20 thread, at 85 per cent thread, is 30 inch pounds and 1-8 thread of corresponding conditions is *720* inch pounds.

If the machine has to be used in such a manner then some means of torque control should be incorporated into it. This can be very easily done by using the correct size Safe-Torque Driver for job variations.

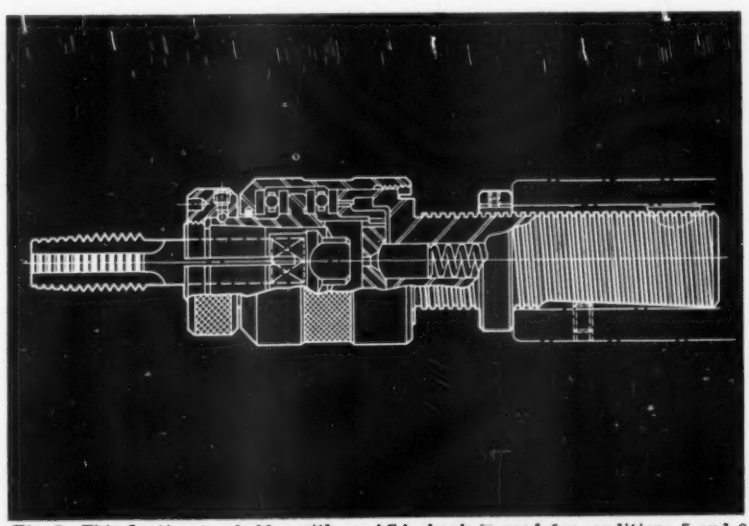
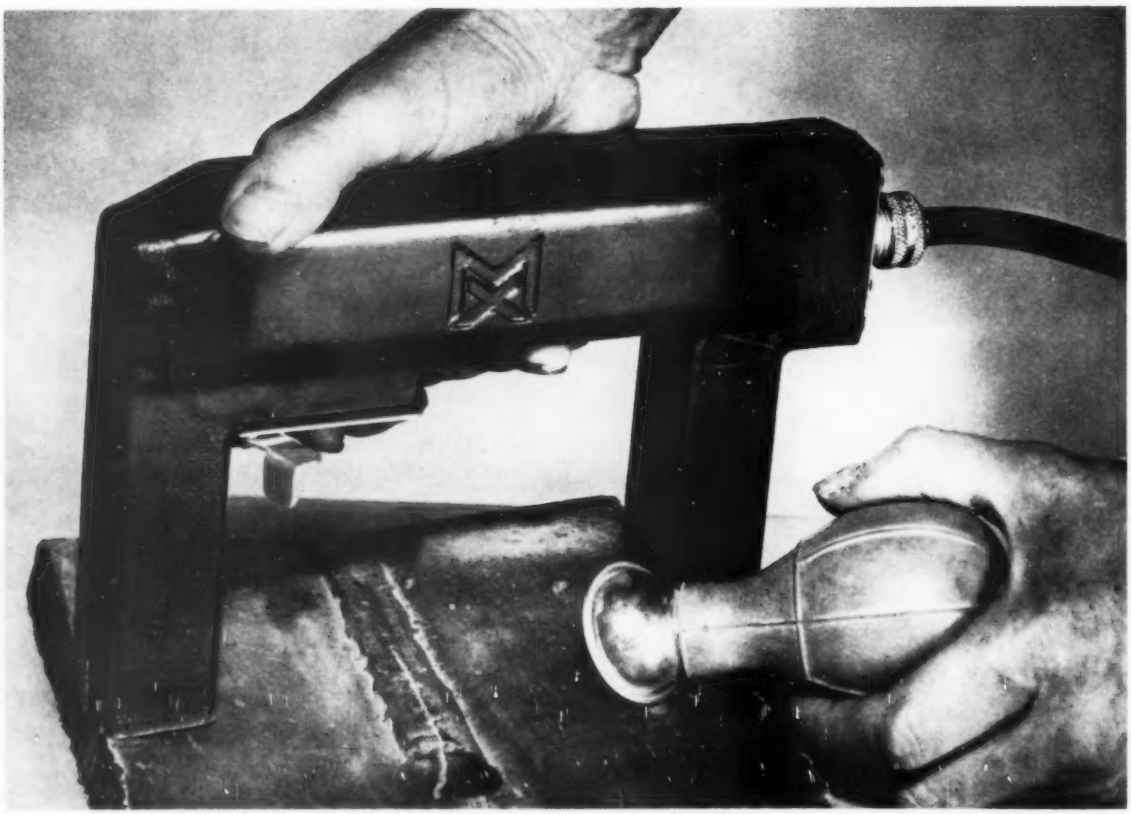


Fig. 3. This floating tap holder with an ASA shank is good for conditions 5 and 6

Magnetic Particle Kit—
Preventive Maintenance Inspection's Little Helper

Here's a new tool in the plant engineer's bag of tricks . . . It is designed especially for preventive maintenance inspection, weld inspection, and for limited volume inspection of magnetic parts where surface cracks might be



Closeup of a plate coupon shows how the Yoke is used for rapid inspection of welds. Long cord permits big coverage

INDUSTRIAL PLANTS and mills will undoubtedly find this new Y-5 Yoke Kit valuable for preventive maintenance inspection. Travelling cranes, crane hooks, press frames, lift truck forks, parts of heavy conveyors, shafts and many structural items can be quickly inspected with this tool.

Chemical and process industries will find considerable use for the Yoke in checking pump parts, valve bodies, welds, etc. In new welds such surface defects or shrink cracks can be found. This Y-5 Kit, announced by Magnaflux Corp., is also described as extremely economical for inspecting parts of construction equipment in the field.

One man performs the inspection by himself; he can handle the Yoke with one hand, both power control and positioning, and with the other he dusts on the Magnaflux powder. The area covered by each application of the Yoke varies up to approximately 24 sq in., and the Yoke is so light and easily positioned that large areas, many parts, or many feet of welds can be inspected per man hour. It is described as easy to use even in restricted areas, and its 100 ft input cord permits flexible operation.

A magnetic particle inspection unit, the Y-5 Yoke Kit comes in a metal carrying case and weighs less than 30 lb complete. The Yoke itself weighs only 7 lb, but the Kit also includes Magnaflux powder, powder bulbs, and operating instructions. The unit draws only 6 amp from a 110 v d-c line.

Want More Information?

If you do, simply write the editor, or jot down "Y-5 Yoke" on one of the postage-paid cards elsewhere in this issue and drop it in the mailbox.

Fig. 1. Reduced-size print of assembly drawing in foreground was made from the same tracing as print in the background

Reduced-Size Prints

Save Money, Time, Space, Postage for North American

NORTH AMERICAN Aviation, Inc., International Airport, Los Angeles, California, is effecting "a substantial saving" in blueprint paper by reducing large engineering drawings to one-quarter size photocopies for shop and office use by means of a new reducing camera. In addition to the savings in paper, North American reports savings in filing space, shipping costs, and time in handling the smaller prints.

Excellent quality and good legibility are obtained in the quarter-sized reproductions, made by continuous copying procedures in the company's reproduction department at the main plant in Los Angeles. The camera is most effectively used for reducing original roll drawings which may be any length by 42-in. wide. Since there may be thousands of drawings required for the assembly of a modern jet fighter plane, considerable savings in print materials is realized by using the reduced-size copies.

The camera, made by Peerless Photo Products, Inc., makes reduced-size photocopies of any original, whether drawn or printed on paper, cloth, vellum, or other material. It offers reduction ratios from 2:1 up to 6:1, and can make either right-reading or mirror-image copies, on either sensitized paper or film.

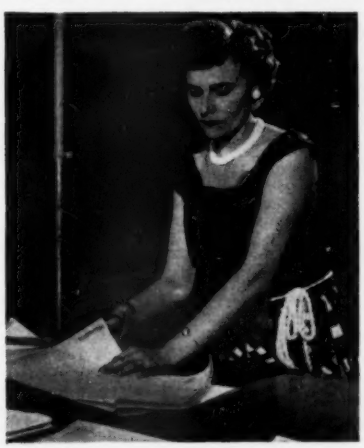
Processing of the camera's photocopies requires no darkroom. An automatic daylight processing unit comprising developing, quick-stop, fixing, and washing tanks is supplied with the camera. The exposed paper or film runs continuously through the four-tank unit onto a dryer and then is rewound on a spool or immediately cut to size.

Practical uses of the camera include the making of small-scale photographic prints for field and shop, condensed records for occasional reference where large-scale prints are not readily available and where the use of visual aids is practical. The camera may also be used to make an inspection record of parts on a conveyor.

Fig. 2. Original tracing is fed into the Neo-Flow camera. Camera makes a one-half-size copy which will then be used in producing reduced-size blueprints

Fig. 3. Using a reduced-size photocopy of the huge assembly drawing the operator makes four prints in same space formerly required for one print

Fig. 4. Here, an employee at North American Aviation folds and cuts apart two reduced-size prints. Each print uses one-fourth as much paper as before



What an Instrument Department Might Do in Your Plant . . . I

This first part of a two-part article describes the advantages of having a specialized instrument department in your plant . . . Duties and responsibilities of such a department are detailed . . . Part two will give information on personnel, and education and experience of these men

By CHESTER S. BEARD, Research and Development Engineer
Foster Engineering Company, Union, New Jersey

IN ORDER TO describe how an instrument department may be valuable, the term "instrumentation" must be defined so that you may be sure that the problems and suggestions to be discussed apply to your factory plant or business. The Instrument Society of America presents this definition: "Instrumentation is the science of devising and applying instruments for instrument systems for measuring physical and chemical quantities, such as temperature, pressure, humidity, position, composition and flow — in commerce, industry, technology and science."

This discussion is directed particularly to those who deal with commerce and industry of the type which has problems of applying instrumentation as defined above.

We take for granted that a concern which requires accounting work has an accountant; personnel men are employed to deal with personnel problems; electrical problems are handled by the electrician. But what happens in many plants and factories which have instruments and instrument problems? In too many concerns, the instrumentation is tossed to the project engineer along with the rest of the plant design.

This man takes the electrical items to the electrical engineer, housing considerations to the structural engineer, heat balance considerations to the heat balance group, and finally he goes hunting in his own group (or out of it) for the guy who has been bitten by the instrument "bug" and who, most likely, is spending his evenings studying instrumentation, or is attending classes in instrumentation. Lacking this individual, the project engineer assigns the task to one of his neophytes.

In the smart outfit, there is an instrument engineer ready to take on these headaches, and with his assistants (if the load warrants) to take over. This beautiful picture isn't apparent in enough companies.

Most companies have a few of these rugged individualists with "instrumentitis." These engineers find themselves drawn together until they resemble an instrument department. However, these poor fellows do not have a recognized status. There is no supervisor to coordinate their work. They haven't the incentive of departmental morale. The following discussion will try to show what will happen if this group is organized into an instrument department with a chief instrument engineer, instrument engineers, trainees and clerks—whatever the size of your company requires.

Discussions to follow are general; you must apply the ideas which hit close to home.

The field of automatic control is advancing so fast that it now becomes impossible for any one man to keep up with this expansion. The instrument department can, on the other hand, do justice to the research which is necessary to keep abreast of the innovations that affect the work of the parent company.

Accomplishment of this type of research requires a good knowledge of the developments of past years,—developments which have now become accepted procedures. Fancy the part-time instrument man having this background! One of the fine instrument departments of southern California keeps abreast by assigning a portion of the entire field to each member of the department.

Handling Problems

To keep up with any or all phases of instrumentation the engineer must digest the literature, attend classes, have a contact with the field applications, and listen to the salesmen. He cannot belittle the contribution that salesmen give to this type of work. Instrumentation is moving so rapidly that we must recognize that the instrument companies are the ones that are developing a large share of the new equipment and they must be the ones who educate us in the use of this equipment as it relates to our own project.

Pity the poor instrument company representative who is required to tell his story to numerous people who are widely separated both geographically and mentally. Compare this to the time required in getting the small

(Continued on page 98)

About the Author

Chester S. Beard is a westerner by assimilation, having left Minneapolis, Minnesota after his first year in the University of Minnesota in 1921. He completed his college work in Electrical Engineering at the University of Southern California. Shortly afterwards he was inveigled into the gas business to work on one of the first natural gas conversions. Like so many of the Instrument Engineers of today, Beard was a meter and regulator man before the new classification existed. He has been an Instrument Engineer in operations in the oil fields, a magnesium plant for Permanente Metals, Inc., the butadiene plant for the Southern California Gas Company, in design with the Bechtel Corporation, and then in the east for Ebasco Services, Inc. His most recent assignment for Ebasco was the instrumentation of the new Rayonier, Inc. dissolving pulp mill at Jesup, Georgia. Beard is now Research and Development Engineer for Foster Engineering Company of Union, New Jersey.

What an Instrument Department's Duties Might Be

1. Discussion of Job. The Job Engineer outlines the scope of the job to representatives of the Instrument Department.

2. Instrument Specification. This may be made up for a preliminary proposal or estimate on the job, but will be the guide to the engineering of the instrumentation. It should include such things as instrument numbering system, units of measurement, calculation methods, etc.

3. Schedule. The Instrument Engineer must make time allotments and set dead lines so that he may make up his schedule of the entire job.

4. List Instruments on Specification Schedules. It is assumed that some type of piping and instrument diagram or flow sheet has been prepared by the Project Engineer. During the process of listing the instruments, inaccuracies or differences of opinion should be noted.

5. Preliminary Valve and Orifice Sizing. It is important that valves be requisitioned and selected early in the engineering of the job so that piping design can proceed immediately. The sizes of the valves and the location of orifice meter runs must be determined.

6. Prepare Quotation Requests. Requests for bids must be distributed to pertinent suppliers very early in the engineering.

7. Prepare Preliminary Instrument Piping Order. The ability to obtain critical materials changes from day to day, but it is always advisable to place a preliminary order for possibly 60 per cent or 70 per cent of the estimated requirements.

8. Engineer Individual Instrument Installation. It is to be assumed that your Instrument Department has established standards relating to the installation of different types of instruments. If this is not so, a little extra time will be required for a particular job in order to set up standard installation drawings. If these exist, it is necessary only to include the correct title, drawing number, instrument numbers, etc.

9. Design Control Board Layout. The approach to this problem varies considerably with the type of job and with various companies. On fairly simple jobs or those not using graphic boards, a layout sketch may be presented for discussion and approval.

10. Analyze Quotations. The quotations for each Bill of Material are assembled by the Purchasing Department and transmitted to the Instrument Department. A summary of bids is prepared and, with the recommendations of the instrument department, is submitted to the job engineer.

11. Revise Bills of Material. The original instrument schedules must be revised to conform with the specifications of equipment to be furnished by the supplier who has been selected upon the basis of the analysis of quotations. Any changes in instruments due to changes in instrumentation may be incorporated in the revision.

12. Supervise Drafting Layout. The advantages of having an instrument department identified as such, carry over to the drafting room. Economies in drafting may be made by having a group of draftsmen who are doing this type of work at all times and so are trained for the work. Close cooperation between the instrument engineer and the instrument draftsman or the draftsman assigned to this work is necessary in the location of the instruments, instrument troughs and instrument lines.

13. Tabulate Orders for Instruments. It is advisable to keep a log for checking orders. Tabulations could include dates or original writing, placement, acceptance and delivery.

14. Certified Prints. These must be checked upon arrival against the order and instrument specification sheet. Delivery of these prints must be expedited. Use is made of the print file record in this work, if one exists.

15. Name Plates. This is another controversial item that requires the approval of a proposed list. Upon approval the plates are ordered on the basis of a name plate schedule.

16. Special Installations. When the drafting shall have proceeded far enough to reveal any installations that require unforeseen variations from the standards, these variations must be discussed in order to determine the proper handling which is necessary for completion of the engineering.

17. Check Purchase Orders. Copies of typed purchase orders as sent to suppliers are sent to the Instrument Department for check. This is an important check because the purchasers, many times, may not completely understand certain details in the instrument specifications and may misinterpret them when writing the purchase order.

18. Calculate Orifice Sizes. Changes in flow data should have been established at this point so that a re-check of orifice sizes may be made. The purchase order for orifice plates is written upon the basis of this re-check.

19. Material Order Revision. At a time when the drafting has progressed so that the instruments are located, the preliminary instrument piping order may be revised. Many methods are used in obtaining the quantities of small fittings that are required for instrument installations.

20. Complete Instrument Progress Schedules. At a time when a major portion of the purchase orders are placed, installation diagrams are prepared, certified drawings are received. Instrument time schedules may be revised to include this data.

21. Drafting Check. The instrument drawings must be checked and approved by the Instrument Department for transmittal to the job engineer and thence to the field. The extent of the check depends on whether or not the instrument drafting group includes an instrument checker. If it does not, the Instrument Engineer must make a very close check to be sure that all instruments have been included.

22. Recapitulation of Engineering Material. The Instrument Department's copies of memos, purchase orders, drawings, etc. must be assembled for filing. Any information which should be in the job file for this particular project should be delivered to the Job Engineer.

23. Photostat Book. Complete procedure requires sending a book including all drawings, installation requirements, operating instructions, etc. to the client or to your own field in an operating company. A large portion of this book is usually taken up with considerations of instrumentation.

24. Spare Parts. When spare parts are required, the Instrument Department will determine what is needed and write Bills of Material for the purchase of the parts. In most cases the supplier should have been requested to submit a recommended list of spare parts for each piece of equipment. Considerations of the necessity for spare parts varies considerably.

instrument group together and, in a very well-thought-out manner, giving them his story. Along the same line, consider the time spent by the neophyte in instrumentation in bringing his own knowledge up to the point where he is capable of undertaking the instrumentation problem of the day. With random assignments in all branches of the design of a plant, this beginner may not be called upon to consider these same questions for many months. In this period of time he may lose his working knowledge of this phase; for even the considerations may change.

As a member of an instrument group, he is continually using this information in one way or another so that his basic background does not have to be changed or duplicated. Background knowledge gives the engineer a head-start on a recurring instrumentation problem such as the duplication of an existing unit or the design of a plant similar to the one now in operation.

The instrument department has a backlog of the successful approaches, as well as field information concerning difficulties. Each member of the department may have much of this knowledge in his own head, or at least knows where it is available. Compare this to the random assignment method in which the man to whom the project engineer has assigned instrumentation must accumulate a background.

Economy of time will most likely dictate that he follow the well-established, although not necessarily desirable, method of "going along with" precedent. It would seem that innovations are of a higher grade when all of this background is accumulated within one group.

Aids and Applications

Although it has been stated that the instrument companies are responsible for much of the new equipment, the application of this equipment to particular operating procedures in chemical plants and refineries still remains in the hands of the engineers who are doing the design for their companies.

In instrumentation, as in many other phases of engineering, the text book is usually obsolete when it is printed. It is valuable, but it cannot offer the entire background to a problem.

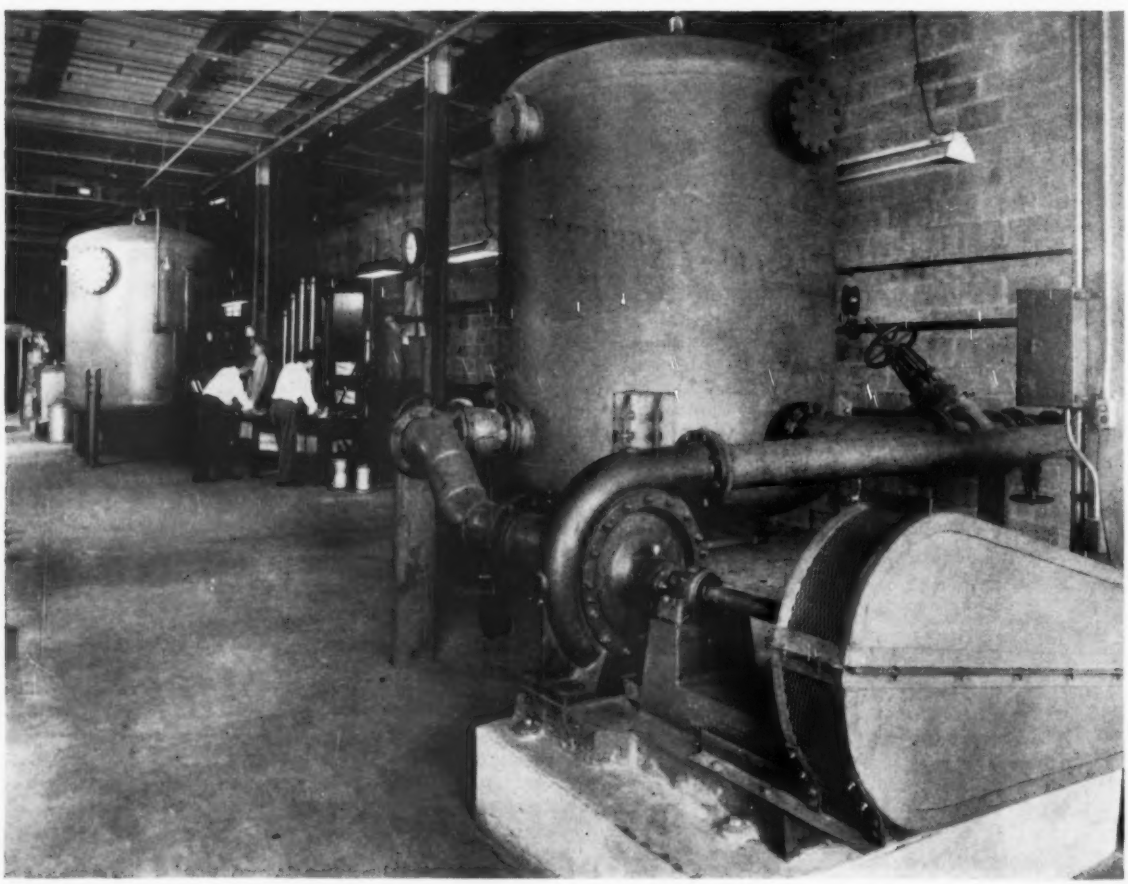
Articles in trade journals, papers read before technical societies, and engineering information in company catalogs, as well as the data sheets supplied by instrument companies, are the types of material which are relied upon for present-day instrumentation. An important adjunct to this material is an opportunity to meet with men who are interested in one's own line of business and to discuss with them the problems involved.

"Standardization" is a naughty word if it in any way encompasses the idea of stagnation. On the other hand, if it means continual use of the successful factors of an approach, "standardization" and the use of standardization is very important until superseded by new developments. Channeling instrument problems through an instrument department makes it possible to use the best methods of approach to the simpler considerations time and time again, until or unless they are found to be inadequate.

The engineer working on measure-

(Continued on page 200)

An important function of an instrument department is calibration. Equipment shown in this photo is used to calibrate primary flow elements by direct measurement of water transfer and test flow characteristics of valves, regulators



Twenty-four 80-lb bags of chemical are shown here being supported by the pallet. Weighing less than 3 lb, pallet can be kept in multiple-deck stacking before, during and after shipment

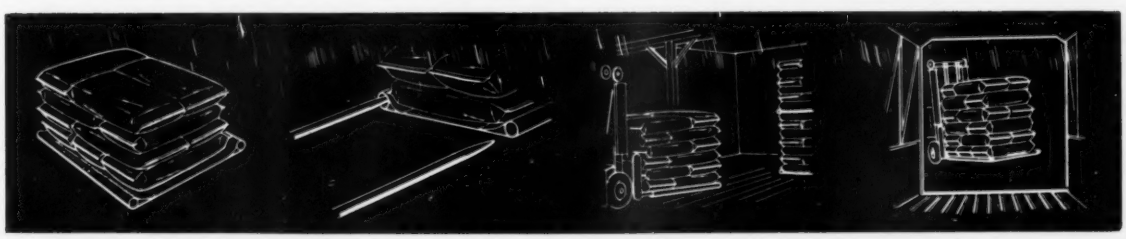
Paper and Tubes, Paper and Tubes That's What These Pallets are Made Of

UNIQUE IS THE name for this new method of industrial palletizing which may revolutionize present ways of handling and shipping bagged and even packaged containers. Developed by American Cyanamid Company, which is already using the method, this Accopak pallet consists simply of a paper sling fitted with paper tubes.

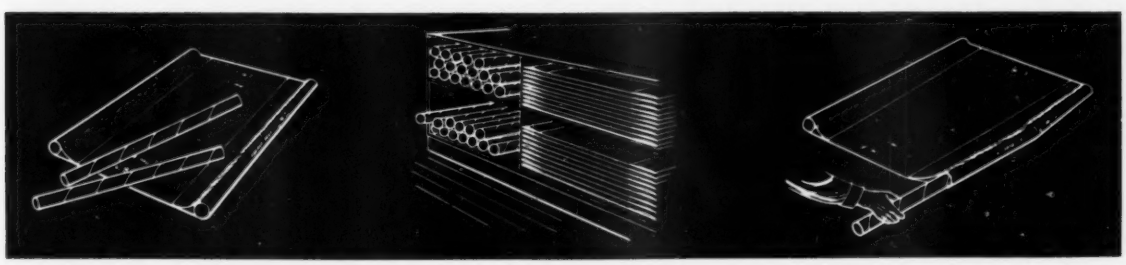
New type bayonet forks, readily attachable to any present type of fork lift truck, slip into the tubes, enabling the palletized load to be lifted, carried and stacked in single, double or triple-deck tiers without removal of the pallet during storage or shipment.

The special forks were designed by Cyanamid and may be purchased for any truck. Change-over from bayonet or chisel type forks is rapid.

If you want more information on the new Accopak pallet just write the Editor, Plant Engineering, 110 S. Dearborn St., Chicago 3, Ill., or indicate "Accopak" on the bottom of postage-paid cards in this issue.



These sketches show ease with which bagged material, resting on the paper pallet, may be lifted by bayonet-type forks



The pallet is simple in design, takes little space in storage and may be assembled simply by inserting tube in loops

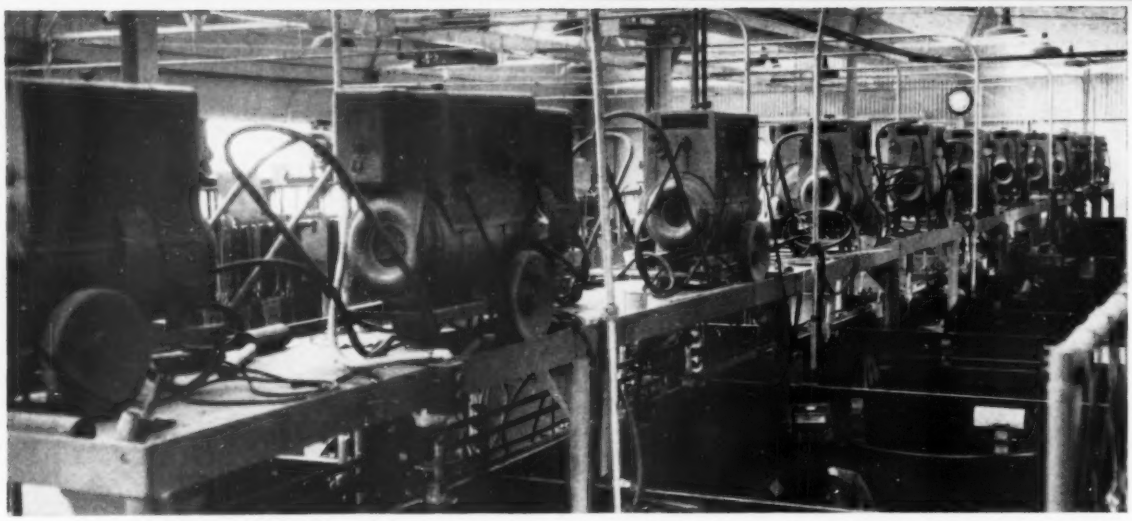


Fig. 1. View of welding booths shows how motor-generator sets are installed overhead to give more room in booths below

Designed for WELDING

Twenty-nine welding booths with twenty motor-generator sets mounted on overhead wood and welded steel platforms are the heart of this new building . . . Added working space, reduced hazards, less waste of argon gas resulted

WELDING WORKING conditions have never been so good as they are in Ryan Aeronautical Company's new self-contained welding building. In the most modern facility of its kind, Ryan has grouped 29 heliarc welding booths and provided the operators with unexcelled space, cleanliness, lighting, ventilation and welding equipment. As a direct result, welding efficiency has jumped 15 per cent over former high standards in just 90 days.

The new building is a metal sash and saw-toothed structure. In it are located the twenty-nine welding booths which perform the heliarc flange seam welding on exhaust systems for Pratt and Whitney engines, Douglas, Boeing, Convair and Fairchild transport planes and Piasecki helicopters, among others. Normally, a hot, noisy and tedious job, the new facilities have made the heliarc assignment a much sought after type of work.

The twenty-nine General Electric 150-amp motor-generator sets, which supply the welding current, were installed on overhead platforms which are approximately 7 ft high. These sets lend themselves to overhead installation because they are compact and relatively light-weight. Platforms are made from welded steel frames and wood and are located along the rear section of each booth.

Every welding booth was equipped with the latest facilities for accomplishing the work. Ryan-designed automatic timers were installed to relieve operators of all responsibility for controlling the flows of argon gas and water. Remote foot controls are used to allow the welders to regulate welding heat while the work is in progress without the necessity for stopping to adjust the machines. Ryan devised a system of remote switch controls, for turning the motor-generators on and off, which are readily accessible to the operators.

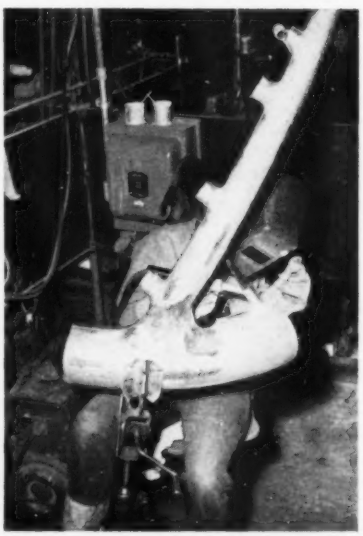
These innovations have given welders more working space by taking the bulky motor-generators out of the booths and have eliminated the ever-present and inconvenient electrical cables which were formerly a floor hazard. In addition, the noise created by the 7½ hp motors has been substantially reduced. Most important, the turbulent flow of air, generated by the motor, has been entirely removed from the floor area where it interfered with good welding operation. This turbulence blew the flow of protective argon gas away from the weld area. In order to counteract this effect, welders had to step up the flow of gas.

A cascade system is utilized to provide all booths with a supply of argon gas and two booths with oxygen and acetylene. The argon is piped from a central storage facility which is supplied by means of tank and truck delivery service. This method cuts gas costs in several ways.

First, the argon can be bought in larger and less expensive quantities. Second, the costs for handling individual bottles for each booth are eliminated. Third, extra space is obtained for each booth by the removal of the bottles of gas from the working area.

For necessary maintenance and repair requirements, the raised motor-generator sets are quickly available. The front curtain bars in each welding booth are hinged and pinned so they may be swung aside. By bringing a lift truck into the booth, the motor-generator can be lifted down and removed to the electrical maintenance shop for work. Another unit may be installed in its place so that welding is not unduly interrupted because of repair necessities.

Fig. 2. This was how an old booth looked. Operator was hampered by cramped space and other inconveniences

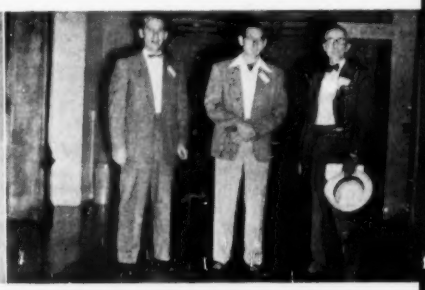


Western Plant Engineers Set Pattern for Industrial Growth

WITH THE ENTHUSIASM OF Forty-Niners, plant engineers and maintenance men from 12 states stormed the Ambassador Hotel in Los Angeles for the First Western Plant Maintenance Conference, determined to establish a standard for this phase of plant engineering work which will accelerate the industrial development of the West. Organization, costs, standards and training for maintenance work form a foundation for broadening the next conference to other plant engineering functions. A Plant Maintenance Show, held concurrently with the Maintenance Conference, at the Pan Pacific Auditorium, registered 7200 attendees.

Connie Grabb, Plant Engineering magazine, converses with Saul Poliak, the dean of industrial show entrepreneurs

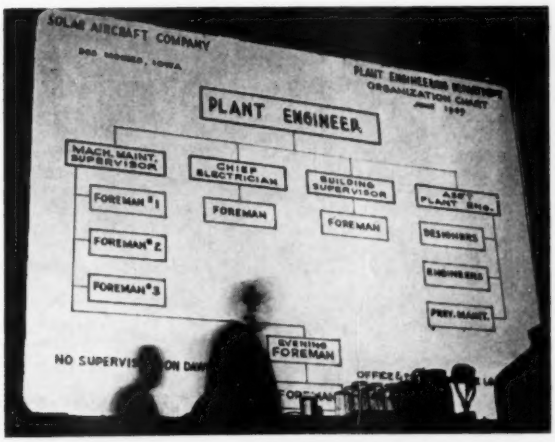
Ken Knowles, vice president, Clapp and Poliak, Inc., and Dick Morris, Plant Engineering, chat outside press room



Fred Muller and Paul Lauerman, of Stuart Co., on way to plant conference, greet F. R. Schalk, Plant Engineering

ALTHOUGH ONLY AN abstract is possible of the various papers presented at this conference, we hope the following pages have captured some of the enthusiasm plant engineers displayed at the First Western Plant Maintenance Conference.

A more complete review of two of the papers will appear in the October issue of PLANT ENGINEERING.



One of the slides used by Maurice Ochoff, plant engineer, Solar Aircraft Co., with his talk. Slide illustrates typical plant engineering organization chart after reorganization

Maintenance Problems In Small Plants

By C. A. GALLAHER, Plant Engineer, Anaheim Div., Robertshaw-Fulton Controls Company

YOU MEN WHO ARE in charge of plant engineering in your company have a great deal of responsibility. I would like to read a general statement of plant engineering functions. "The general function of this department is as follows: Requisition, or engineer, design and construct special or standard equipment, buildings, grounds and improvements. Record, install, move, maintain, repair and prepare for disposal of same." You can well see why you have a very important job to do for your company. *Every year you spend several hundred thousand dollars of the company's money and are responsible for a plant which has a capital net worth of several million dollars.*

About three years ago we had the opportunity to set up a new plant. Having worked for the company in another division and observing many of the mistakes that crop in during the growth of an organization we decided to reorganize the plant engineering department to fit the needs of the new division.

Organization is the most important phase of the operation. Without it, it is impossible to achieve the desired goal of getting the work done in an efficient manner.

In a small plant the plant engineering department and the maintenance department should be supervised under one department head. The reason for this is that by combining these two operations it is possible for the department to carry out its phase of work completely and without interference. If these operations are combined it makes it possible for the plant engineer to have full control over requisitioning, engineering, designing, construction and maintenance on plant equipment, buildings, grounds and improvements.

Due to the importance of the plant engineer's job he should work directly for the Works Manager, Plant Manager or General Manager and should be on the same level of the management team as the Production Manager, Shop Superintendent and Tool Engineer.

Under the direct supervision of the plant engineer there should be five sections, namely, designing section, mechanical section, general section, electrical section and stores. The reason these are called sections instead of maintenance groups is that in a small plant these units not only maintain, but construct and build new equipment and if the plant should grow they can be readily changed into departments.

The designing section has under its supervision all changes, new work and special equipment.

General section, of course, has the normal personnel which includes painters, general maintenance men, gardeners and millwrights. This section is responsible for the moving of machinery, maintaining grounds, buildings and so forth.

Electrical section should be responsible for all electronics and electrical equipment. These two phases of work should not be segregated because they are so closely allied to each other in a small plant. The craftsmen working in this division may be specialists in their own field but should be under one supervisor.

Mechanical section of the plant engineering should receive special attention for this division's activities require a variety of skills and labor. The supervisor should have machine repair men, machine builders, oilers, machine cleaners, chip pullers, coolant and oil dispensers. If the policy of the company is to keep the machines painted he should also have a painter under his jurisdiction. As I have stated before, any supervisor given a job to do should have the necessary men and materials to carry out the activities of his operation. As you can see if a machine needs repair he has the manpower under his direction to remove the coolant and chips, clean the machine, make necessary repairs and repaint it if necessary without asking for help from any other supervisor.

Stores are normally considered money in the bank and should come under the Accounting Department or under a general stores supervisor. It is my opinion that the plant engineering department should have its own stores. This at first might seem to be a separate and expensive operation. However, if it is possible for the plant engineer to have complete control over repair parts, supplies and equipment purchased, then there is no reason why the department cannot fulfill all of its responsibilities.

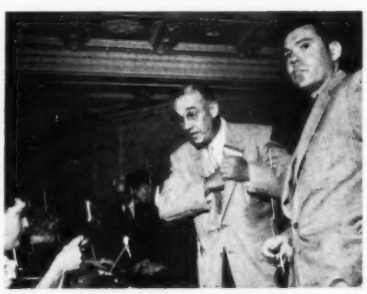
As the plant engineer has at his discretion the requisitioning of all plant equipment it would be well to call the interested parties in case of purchasing production equipment. The people involved should be the Tool Engineer, Industrial Engineer and Plant Superintendent. These three men all have work to do with this piece of equipment and should have a voice in its purchase.

Now that the department is organized the next thing that should be done is to draw up a department organization chart. This will firm up the lines of authority. A procedure manual should then be written and should embrace the specific responsibilities of the department as a whole and the sections in particular. You will find that in writing these specific responsibilities they can be clearly defined and there will be no doubt in the supervisor's mind as to the scope of his activities. With these responsibilities well defined and the supervisors placed on the same level of authority they will work very well together. One supervisor will readily loan work or men to the other section wherever the work load is the heaviest without worrying about losing some of his authority or responsibility.

As to communications: The supervisors should have all of the information about company policy, wages, vacation pay and general information which the workers might ask them. The workers will then get in the habit of asking their direct supervisor any questions that they might have. This will stop plant rumors.

Roy Fisher, chief plant engr, Rheem Mfg. Co., with C. M. Vigil, general foreman, maint, Douglas Aircraft Co.

A. E. Storm, chief project engr, Tide Water Associated Oil Co., and G. Snyder, maintenance supt, Union Oil Co.



J. S. Hutchison, chief engr, Exchange Lemon Products Co., checks in. W. W. Nute, Rheem Mfg. Co., is next in line

J. M. Weeks, plant engr, Plomb Tool Co., discussion leader, and D. L. Newton, works mgr, Kwikset Locks, Inc.

Planning and Scheduling

By GEORGE J. MARTIN, Manager, Mech. Div., National Biscuit Co.

As COST CUTTING and improved efficiency should have top priority these days, modernization of the maintenance operations in the older plants is a challenge to management as the results and savings can be more striking when a comparison is made between the methods they have been using with the new and more efficient maintenance methods that can be developed.

Establishment and adoption of a good maintenance program can only be arrived at after a careful analysis and survey of existing conditions. This analysis must be performed by a group of individuals, who by training and experience, are capable of determining the following:

(1) Scope of maintenance operations; (2) Par condition requirement for machinery, equipment and buildings; (3) Qualifications of all maintenance trade personnel; (4) Efficiency of maintenance crews; (5) Job knowledge covering all crafts; and (6) Knowledge of planning and scheduling procedures and personnel required.

Next, it is very desirable to outline the functions and responsibilities of the maintenance personnel.

The plant engineer having the major responsibility for the supervision of the maintenance operations should divorce himself completely from routine detailed procedures that can be delegated to a person or persons who will become specialists in a particular maintenance function such as planning and scheduling. He then can channel all of the work orders through this department.

A good maintenance program has several definite advantages. Equipment functions at maximum effectiveness, giving the best possible productive results. Kept in the best operating condition, equipment is run economically and efficiently and shutdowns are reduced to a minimum, thereby conserving the time of production employees.

With labor and material costs at an all-time high peak, management is vitally interested in a cost reduction program for maintenance as well as for production as both have a strong bearing on the manufactured product cost; therefore, every effort should be made to increase your maintenance efficiency and reduce your costs through sound planning and scheduling.

Organization Set-Up At Solar Aircraft

By MAURICE OLCHOFF, Plant Engineer, Solar Aircraft Co.

MAINTENANCE OPERATIONS have been greatly influenced during the past half-century due to the growth of mass production, which, by the application of better machines, engineering skill, research, and control devices, to mention only a few, has led us into a period of "technocracy" and, now, "automation."

Maintenance organizations must be developed to operate effectively, taking into consideration this condition over which we have very little control. The automation era may lead maintenance into a position where there will be more maintenance than production personnel in the plant. This is becoming true already in some industries.

Therefore, preventive maintenance should be considered as a function of prime importance and as a "must" function with control established on it comparable to a break-down work order. After the preventive maintenance system has been put into operation, constant study should be made so that economy is applied to the system by eliminating excess work.

Our plant engineering department, of which maintenance is a part, has the responsibility of maintaining all capital investment of the company. This includes building and grounds, manufacturing machinery and operation of all utilities.

Essentially, we have two distinct groups in our department; namely, the Maintenance group and the Engineering group. The Engineering group is headed by the plant engineer, the Maintenance group by the assistant plant engineer.

This is just a brief resume of some of the comments made by Mr. Olchoff. However, a more detailed report of his talk will appear in a future issue of PLANT ENGINEERING.

Training Program

By J. M. FORREST, Supt. Maintenance and Constr., The Dow Chemical Co.

THE PURPOSE of our Maintenance Training Program is to present to the untrained men entering the Maintenance Departments the methods and techniques of carrying on day to day work in maintaining and operating their respective facilities at *our* plant.

It covers three broad areas:

a. Safe and proper use of hand and power tools
b. A knowledge of blue prints and bills of materials, and
c. The necessary technical know-how, safety conduct, and plant standards, to properly complete the job.

Any man entering any of the central shop groups is required to enter the course immediately upon entering the shop. He always enters the shop as a Repairman Class C of his respective trade group and at the lowest rate in that group.

His training covers a 2½ year period consisting of 5 sections of 23 lessons each.

Each lesson consists of a 2-hour supervised classroom period, and a two-hour home study period is required.

The texts consist of an especially prepared manual applying specifically to the methods, equipment and procedures used at our Pittsburgh Plant.

A trainee's weekly grade is based upon the weekly class and home problems. If the trainee is to continue in the course, he must receive 75 per cent minimum passing grade for each six-months' period.

Each man is also rated on his job performance. A man who fails to receive a satisfactory grade in either his classroom work or job performance for a six-months' period is released to the Personnel Department for reassignment.

As the men complete each six-months' period they are advanced in rate. At the end of the 2½ years of the Training Program each man is required to take a qualifying examination.

Any man failing to pass the qualifying examination may take another examination in a six-months' period. If he fails to pass this examination a second time he is released to the Personnel Department for reassignment.

After the 2½ year course, he completes another 18 months before he reaches top journeyman classification.

Panelists G. J. Martin, mgr, mech div, National Biscuit Co.; L. C. Morrow, general chairman; M. Olchoff, Solar Aircraft Co.; and J. M. Forrest, supt maint-constr, Dow Chemical Co.

B. Hill, plant engr, Cannon Electric Co.; P. Belsky, product engr, J. R. Jones, regional engr, both of Westinghouse Electric Corp.; and L. A. Beck, reg mgr, General Electric Co.

Lubrication In a Citrus Plant

By R. C. SULLIVANT, Asst. Pl. Eng., Exchange Lemon Products Co.

IN OUR PLANT, where stringent methods of sanitation involve periodic steam cleaning and extensive use of water and chlorine spraying, the lubrication problems are complex.

Foremost, is the corrosive action of the many chemicals used. Second, the highly corrosive effect of lemon juice. Third, the extremely wet condition due to frequent steam cleaning, and continuous spray of chlorinated water. And, fourth, the temperatures where the canned products are pre-cooled, frozen and stored.

While there are thousands of oiling and greasing points, which consist of all types of bearings, from anti-friction to babbitt and bronze bearings and hundreds of gear boxes, open gears and roller chains which need frequent attention, three lubrication men accomplish the task. Two of them are scheduled for day duty and the other one has night assignment. The latter services equipment that is not available during the day hours.

All enclosed gear cases and larger units with large reservoirs of oil or grease, that do not require attention for a number of months, are painted with a distinct stripe and a capsule type attachment is fastened on the unit with the record of the date last serviced. The color of the stripe is changed whenever the lubricant is renewed. By this method, a visual check can be made of units. A further safeguard is made possible by keeping a check-off sheet in the lubrication room.

Program at North American

By ARTHUR E. ZOBEL, Plant Engrg. Supv, North American Aviation, Inc.

PREVENTIVE MAINTENANCE, as the name implies, should be planned to prevent the loss of production that may be caused by equipment failures, preserve the plant investment by prolonging its useful life, and reduce the direct maintenance costs incurred by repairs and overhauls.

A vital tool in preventive maintenance is a soundly planned and controlled lubrication program. The size and complexity of the plant will determine how it should be organized.

A. C. Prendergast, Western Industry, and C. A. Gallaher, plant engineer, Robertshaw-Fulton Controls Company

The selection of the proper lubricants for each machine should be made by careful analysis of the service requirements, experience within your own organization on similar applications, equipment manufacturers' recommendations, and advice of the lubrication engineers available from your sources of supply.

Scheduling the frequency of application, the draining and refilling of reservoirs, filtering where used, and inspection are vital to insure the desired results. A procedure covering this should be established, placing the responsibility.

Records must be provided and kept to provide these controls. This is best done by having a lubrication record card for each machine listing all pertinent data on points of lubrication, type of lubricant to be used, and frequencies to follow.

Our Lubrication Committee is responsible for the selection of the lubricants, application of equipment, and advising the maintenance department in scheduling, application techniques, and assisting in analyzing all problems relative to lubrication.

This Committee is composed of a Plant Engineering staff member, an industrial engineer from the group responsible for design and procurement of machinery and equipment, the mechanical maintenance foreman, a lubrication specialist assigned to the maintenance department, and a representative from the production development laboratory.

How It's Handled at McCulloch Motors

By H. M. EVERSZ, Plant Engineer, McCulloch Motors Corp.

CONTINUED AND TROUBLE-FREE operation of machinery and equipment is the most important problem of any maintenance group. It seems to us at McCulloch's that the most basic approach to preventive action is proper lubrication. So, we have used our lubrication supervision as the starting point in building our preventive maintenance organization.

We started with a hydraulic specialist and gave him a fairly free hand in clarifying and solving the needs of the plant. During his first year he asked for a lubrication analysis by the major oil companies. This was done and the net result was a better defined lubrication program, more carefully marked lubrication points on equipment, a time sequence for coverage, and a reduction in the number of lubricants used.

In the building of additions to the plant, we were able to set up a unique oil house and we tied in the salvage and dispensing of all liquids used in the plant. This included salvage of hydraulic oils and cleaning solvents, as well as scrap metal and waste disposal. By doing this we could show a dollar and cents return to the company. Solvents had been dumped and used oil sold for two cents per gallon. Scrap metal had been going for the hauling.

The savings in the first nine months of the new program paid for all costs of oil house, waste bins, stills and filters. In fact, our report for May, 1954, shows a total liquid reclamation savings of $1,031.60.

T. Freeman, mech engr; K. Coghill, genl foreman; N. Ferigstad, plant layout; W. Verplant, pl engr, Douglas Aircraft

Questions, Answers On Lubrication

By JAMES FRIER, Lubrication Engineer, Kaiser Steel Corp.

LUBRICATION PRACTICES in our plant can best be detailed by answering a series of pertinent questions, as follows:

Who should have the responsibility for selection of lubricants?

The Lubrication Engineer should be responsible for the selection of lubricants for the plant. Specifications for all lubricants should be given to the Purchasing Department and all petroleum suppliers.

Who should have the responsibility for application?

Lubricant application responsibility is that of the Department Foreman to the Oiler on shift. It is also assumed by the Ass't. Supt. of the Department.

How should the supplies be stored?

In our plant, all full drums and quarter drums are stored horizontally, in racks in the Oil Yard. Smaller packages are stored under cover.

How should they be issued?

This is the responsibility of the warehouse and is controlled by requisitions issued by authorized personnel.

How should applicators be stored, maintained, and issued?

This is another responsibility of the warehouse or stores, and issues are made in the same manner as with lubricants.

The maintaining of this equipment, while in use, is the responsibility of the Turn Foreman. Oilers make minor adjustments and repairs.

Setting up the calendar for lubricant application in the interest of preventive maintenance.

This is the responsibility of the Lubrication Engineer and is accomplished by means of a Lubrication Chart. The chart lists every piece of equipment in each individual mill, also gives a breakdown of the machine showing each part to be lubricated and at what interval, as well as the lubricant to be used.

Keeping records.

The Lube chart provides the Department with a record of the lubrication performed, the amount of lubricant used and where it was used.

Analyzing failures due to faulty lubrication.

This is the Lubrication Engineer's responsibility. However, the Turn Foreman or Department Foreman is consulted if the failure is not a direct lubricant failure, but over-lubrication or under-lubrication.

Maintenance of Electrical Distribution Apparatus

By PHILMORE BELSKY, Switchgear Product Engineer, Westinghouse Electric Corp.

MODERN DISTRIBUTION system equipment is designed for long life with minimum maintenance, but there is no assurance that it will continue to do the job for which it is designed unless a definite, scheduled program of field maintenance is established.

The following brief recommendations are given as a guide during normal operation for air and oil circuit breaker metalclad switchgear, low voltage metal enclosed switchgear, dry type and liquid filled transformers.

High voltage drawout air breaker metalclad switchgear in the 4.76 kv or 15 kv class provides unusual safety features and simplified maintenance procedures. Each compartment is segregated with full steel barriers to assure maximum safety, and low voltage control equipment is accessible without entering high voltage compartments.

B. L. Peak, plant supt, Sterling Electric Motors, Inc., and B. J. Bannan, genl mgr of the Western Gear Works

Probably the most important parts of the breaker are its moving and stationary contacts. The air breaker contacts can be exposed for inspection and maintenance by removing the external barrier and arc chutes after withdrawing the breaker from its cell.

The insulating parts of the breaker arc chute are subjected to full line potential with the breaker contacts open. Therefore, it is essential that this insulation be given proper care.

All varnished organic insulation surfaces require periodic attention to maintain maximum insulation strength. Such material should be washed with solvent which will not harm the varnish, quickly vaporize and leave no residue. After the solvent had dried, the surfaces should be washed with distilled water and dried.

The maintenance of metalclad switchgear in 4.76 and 15 kv class using lift type oil circuit breakers parallels very closely the recommendation outlined for air breaker switchgear. The only basic difference is in the oil breaker element. A test rack is provided with this class of equipment on which the removable breaker element can be elevated and the breaker tank lowered to expose the contacts and interrupters.

Each pole unit should be inspected to see that operating levers are in good condition, that lift guides and rods are not cracked or warped and contacts are properly secured and make good contact.

Low voltage drawout metal enclosed switchgear of the 600 volt class is arranged in a drawout construction wherein the breaker elements may be removed from the compartments for maintenance or inspection on a set of removable rail extensions. Interlocks are provided to prevent accidental contact of energized breaker parts.

A maintenance schedule for dry type transformers depends upon existing operating conditions. For dry, clean areas, inspection once a year may be sufficient. Contaminated atmospheres may necessitate maintenance every few months.

Liquid filled transformers, whether oil or Askeral type, will require inspection to determine whether there are any conditions indicating the entrance of moisture either prior to energizing or while in service.

Utmost care must be exercised in keeping the liquid clean, not only when filling the transformer tanks but whenever the tanks might be opened for inspection.

Many of the tests and procedures outlined require special apparatus which can be purchased or fabricated. However, most manufacturers of switchgear and transformer equipment maintain local facilities and personnel which, together with test apparatus, are available for use.

Pointers on the Care of Electrical and Lighting Equipment

By J. ROY JONES, Regional Engineer, Lamp Division, Westinghouse Electric Corp.

MANY OTHERWISE well-managed companies neglect the maintenance of their lighting system. To be sure, the lamps are replaced reasonably soon after they fail, but that is where the "lighting maintenance" begins and ends.

That lighting reflectors should be cleaned regularly is self-evident. However, the rate at which the light output of a reflector diminishes, and the degree to which it depreciates under various conditions, is not self-evident. Scientific measurements with elaborate photometric equipment is the only accurate method of acquiring this information. Such measurements have been made for various kinds of lighting equipment under various conditions.

The principal advantage of replacing all lamps in a group rather than one at a time as they fail is that a big saving in lamp replacement labor costs is possible by the "mass production" method. It is not uncommon to effect a saving of fifty cents per replacement in fluorescent installations. In high bay installations where the labor costs are usually higher, savings are correspondingly higher.

In the purchase of equipment for new installations, consideration of the future maintenance problems may save a considerable amount of money later—just as planned lighting is better and more economical than lighting that is installed without a thorough study of all the factors involved. Most electric utilities maintain a staff of well-trained engineers to assist their customers in designing planned lighting. They will also make recommendations on maintenance of the equipment.

C. Ramsey, steam engr, and J. Conner, maint engr, Van de Kamp Baking Co.; J. Panella, pl engr, W. P. Fuller & Co.

In high bay areas where the atmosphere contains extreme quantities of dirt, smoke, or corrosive fumes, enclosed equipment is recommended. These reflectors maintain their light output slightly better than ventilated open reflectors if the air contains ordinary dirt. If there are corrosive fumes present open aluminum reflectors are often unsatisfactory.

Thus, in an existing lighting installation the maintenance program is a simple one. It consists of cleaning the lighting equipment regularly and of employing a group replacement system for renewing lamps. The frequency of cleaning and the point in life at which to replace lamps depend on the particular installation, the types of reflectors involved, the types of lamps in use, and other factors. A complete study of each individual case is necessary in order to make firm recommendations.

Maintenance of Electric Motors and Controls

By L. A. BECK, Manager, Service Shop, Pacific Southwest District, General Electric Co.

INDUSTRY TODAY is well into the second "Industrial Revolution"—the gradual but determined swing to plant automation. Increased production at lower product cost is demanding more effective maintenance. It is now productive maintenance, capable of creating added output without additional machines.

There have been many studies made of motor failures resulting in a more-or-less accepted list of causes. They are in order of frequency: 1. Dirt and foreign material; 2. Moisture; 3. Improper lubrication; 4. Friction and vibration; 5. Incorrect voltage; 6. Acid and chemical fumes; 7. Overload; 8. Old Age.

Let's turn to number 8 on the list of motor failures—old age—and see how a critical motor approaching its life expectancy can benefit from a planned maintenance approach. As an example of this type of motor maintenance, let's consider a 500 hp, slow speed d-c motor on a machine critical to production at a large western paper mill. To determine how much protection is required the following steps will aid us in arriving at an answer:

1. Calculate repair time under the following conditions assuming major failure: a. No critical parts stocked; b. Some critical parts stocked (such as coils); c. All critical parts stocked (such as complete armature); d. Complete unit stocked.

2. Determine cost of repairs and inventory for each of the conditions.

3. Total this information to determine the total "failure cost."

4. Analyze total cost for each condition to determine what you must stock to protect the equipment.

The problem is to determine how much an armature failure will cost assuming production outage is $700.00 per hour.

By this type evaluation the customer decided for best protection to stock a complete armature. Having obtained the most critical part, management may then decide to replace the armature during a planned outage when there would be no loss of production and the additional saving of $4,900 for seven hours down time.

Table I. Evaluation of Critical Parts Protection Requirements—(The Evaluation is based on the failure of a part which requires the longest repair time such as armature coils)

	No Major Parts Stocked	Armature Coils Stocked	Complete Armature Stocked	Complete Machine Stocked
Repair Time	10 days to make coils & rewind X	6 days to rewind armature X	7 hours to install new armature	3 hours to replace motor
Total Downtime Cost	$168,000	$100,800	$4,900	$2,100
Cost of Parts Protection	0	Coils: $4,664	Armature: $25,600	Motor: $46,000
Cost of Repair	$12,730	$5,900	Installation $850	Installation $360
Total Failure Cost	$180,000	$111,364	$31,350*	$48,460*

X—Add disassembly, assembly and transportation time to actual repair time.

*—Add repair cost, on straight time basis, of failed unit.

Zoning Maintenance in a Petroleum Processing Plant

By ARTHUR E. STORM, Chief Project Planner, Avon Refinery, Tide Water Associated Oil Co.

THE MAINTENANCE and Construction Department of our Avon Refinery is sized to take care of all normal maintenance, including unit turnarounds, without outside help. The valleys between peak maintenance loads are taken up by doing new construction work. Extraordinary maintenance, such as cat cracker turnarounds, requires outside help. Major maintenance, such as tankage repairs, furnace repairs, building and facility painting, wharf repairs, etc., is often wholly or partially contracted.

Dick Morris, second from right, discusses plant engineers clubs with F. Reibin, Enterprise Engine Div., GMC B. Flett, Bethlehem Pacific Coast Steel Corp; H. Wood, Marchant Calculator

The refinery is divided into two areas, each area headed by one Area General Foreman. One area embraces all operating units except the straight-run distillation units and attendant stabilizing unit and is divided into two zones. Each Zone is headed by a Zone General Foreman.

Zoning Areas

A second area covers a large geographical portion of the refinery, including tank farms, shipping terminals, blending and packaging facilities, etc. This area is also considered a Zone and has a Zone General Foreman assisting the Area General Foreman. The Area and Zone General Foremen are general supervisors in charge of all work performed by the Maintenance and Construction personnel within their respective areas and zones.

Approximately 85 per cent of all work by the Maintenance and Construction Department is planned on a daily basis. The optimum percentage of unplanned work is difficult to determine. Our present 15 per cent status has been developed through carefully controlled trial and error.

Organization for the planning and scheduling of Maintenance and Construction work is divided into three parts. The over-all coordination and supervision of this function is the direct responsibility of the Superintendent of the Department. The three parts are:

1. The planning of relatively small but numerous maintenance jobs that the continuous operation of refining units demands.

2. The planning and long range scheduling of large maintenance jobs, including unit turnarounds, and new construction work.

3. The day to day scheduling of work.

It is to be noted that all work is specifically authorized. No work is done by the Maintenance and Construction Department unless it is authorized in writing. Unless there is an emergency, verbal or telephone requests are not honored and emergency requests must be confirmed in writing. The motto is "No tickee, no washee."

Sanitation Tools In A Canning Plant

By BRUNO PILORZ, Retired, Formerly Chief Operating Engineer, California Packing Corp.

WITHIN THE LAST 10 to 15 years, two powerful tools have been introduced to the canning industry which do a much more effective job of cleaning than was possible under old methods.

The two tools are: in-plant break-point chlorination and high-pressure cleaning systems. At the same time, more efficient detergents have become available. In plants, using break-point chlorination, all water entering the plant, except that used for boilers, syrup or brine making and for drinking fountains, is automatically chlorinated. The chlorine concentration is held, during operating hours when the water comes in contact with the product, at just beyond the break-point and for after-shift wash-down it is raised to a much higher level.

Chlorine added to water, beyond the break-point, prevents slime and odor forming bacterial and mold growth. Such water, running continuously over conveyors, belts, pulleys, floors and gutters, reaches, of course, into all otherwise inaccessible corners and crevices, keeping them sweet and clean.

High-pressure cleaning units are used, at the end of the operating shift to thoroughly clean all equipment and floors. Hoses with specially designed nozzles, attached to the units, direct jets of detergent solution of automatically controlled strength, at high pressure into every nook and cranny, and there dislodge all traces of foreign matter.

Panelists R. C. Sullivant, Exchange Lemon Products Co.; J. Frier, Kaiser Steel Corp; J. D. Garrick, C. F. Braun & Co.; A. Zobell, North American Aviation; H. Eversz, McCullouch Motor

Plant Engineer's Job in Citrus Plant

By J. S. HUTCHISON, Chief Engineer, Exchange Lemon Products Co.

RESPONSIBILITIES shouldered by Mr. Hutchison include the two plants operated by his company. These plants, one in Corona, Cal., and another in Covina, Cal., comprise 34 buildings, covering a total of 528,000 sq ft.

The Maintenance and Mechanical Department, headed by Plant Engineer F. P. McCormack, has a complement of 63 mechanics, in addition to 26 millwrights and construction men and 21 operators of utility and service facilities.

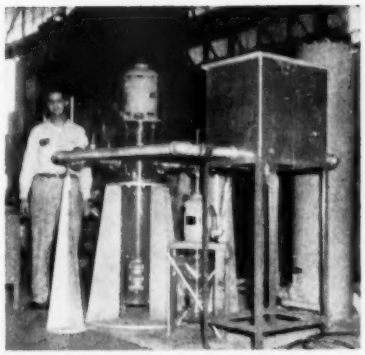
As might be expected, the major problems of maintenance arise from the nature of the product—food. Corrosion is extremely troublesome, because of the acids involved in working with citrus fruits, and extensive preventive measures have been taken.

Lubrication, on the other hand, must be carefully controlled to prevent contamination of the product.

Building inspection is thorough and routine. Flooring problems are severe, again because of the acids involved in processing. Refrigeration—literally tons of it—is maintained on a strict "hours of operation" schedule. Most of the machinery gets a 4000-hr overhaul, and a 9000-hr dismantling and rebuilding. Machinery is inspected by three shift mechanics, one on each shift.

As additional duties, the Plant Engineer is also responsible for the boiler house, water supply, electric power, air distribution, and waste disposal.

This paper is presented here in resume form only, since an article planned for a forthcoming issue of PLANT ENGINEERING *will more completely describe his responsibilities and problems.*



Roland Piersall, plant engineer, Johnson Pump Co., stands beside one of the pump models built by his department

Dispatching Service in an Aircraft Industry

By C. M. VIGIL, General Foreman, Maintenance, El Segundo Div., Douglas Aircraft Company, Inc.

IN OUR AREA type of maintenance we have employees of different crafts assigned to certain areas of the plant. By assigning these employees to specified areas, the amount of time that a machine is out of production is cut to a minimum by the elimination of travel time. We also have installed a maintenance dispatch system.

The dispatcher receives a call and then relays the information by Telautograph to the nearest maintenance man. If a mechanic is not at the maintenance crib to receive the call, a red light goes on at the time the call is received, and when he tears off the paper with the information on it, he presses a button and turns off the light. If several calls are received, the dispatcher can send as many calls as necessary without someone to receive them, and as a mechanic returns to the maintenance area he can take the next call in the order received.

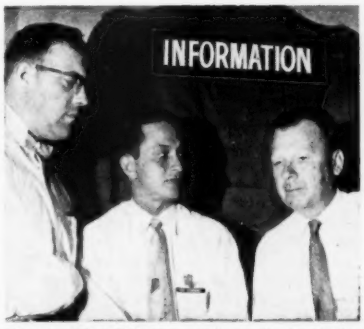
A leadman is also assigned to each area and he checks these calls to see that the most important one is being worked on first. All emergency calls are handled from the maintenance shop where the dispatcher is located.

One phase of maintenance covered by our preventive maintenance procedure is the plant electrical system. Transformers are inspected at regular intervals. The oil is checked and replaced whenever it is found necessary. All of our switchgear at the transformer vaults are cleaned and inspected, the connections on all of the high voltage lines from the transformers to the main distribution system throughout the plant are on a regular inspection schedule in order that a major shutdown of the plant electrical system may be avoided.

We have 30 cranes and over six miles of crane rails which require frequent inspections. Some of the cranes handle complete airplanes and the small cost of inspections is nothing compared to the amount of damage that would be done if an airplane were dropped. Chain hoists and electric hoists are also on our preventive inspection schedule. There are several hundred of these throughout the plant.

Compressed air is of major importance to the aircraft industry. Every department in the plant uses it.

Transportation is of great importance to an aircraft company the size of ours. We operate and maintain 800 pieces of (transportation) equipment. We have a preventive maintenance procedure on this equipment the same as all other machinery in the plant. This is controlled by a master chart which shows the unit miles or unit hours of operation.



G. F. McAlister, prod cost analyst; O. N. Bernabe, foreman; and R. A. Strode, genl foreman, Douglas Aircraft

Maintenance in Metal-Working Plants

By JAMES M. WEEKS, Plant Engineer, Plomb Tool Co.

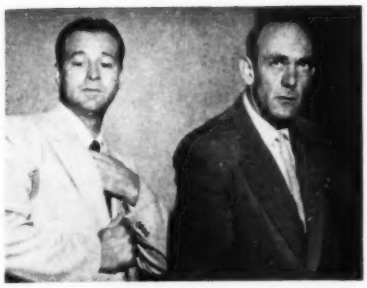
MAINTENANCE FORCE in a metal working plant should be large enough to maintain the buildings and grounds, service equipment and keep production machinery in good operating condition. Obviously, there is no fixed rule for determining the proper size of these departments; each plant has its own peculiarities.

In a new plant, with new buildings and new equipment, there would be a period of time when a minimum number of maintenance people should be able to take care of the routine maintenance and limited repairs. The same plant ten years old would present an entirely different condition.

Even comparison of maintenance forces between two plants of the same size manufacturing a similar product is difficult—and likely to be rather misleading. Machine tools wear differently and require a different amount of labor to maintain. Machine operators are different—and management is different. One plant manager may be one of these fastidious people who would enjoy eating off his factory floor. The other plant manager is interested only in production, cares nothing about housekeeping and operates his equipment until it falls apart.

As a general rule—the percentage of maintenance workers to total plant workers will vary in relation to the size of the product manufactured. Light metal working plants manufacturing a product such as toys will average about 4 to 5 per cent maintenance workers. Plants with a small product, such as the line of mechanics' hand tools manufactured by the Plomb Tool Company, will average from 6 to 7 per cent. It is 8 to 9 per cent for plants producing refrigerators and medium to heavy items.

In the steel mill class of plant, the percentage of maintenance workers may run into the neighborhood of 20 per cent. These percentages are on the increase and no doubt will continue to increase. In order to overcome the high cost of production and maintain a competitive position, management is turning to increased mechanization. This will reduce the number of production workers and reduce total costs but will increase the number of maintenance workers.



H. E. Kidder, plant manager, and R. Hogue, master mechanic, both of H. C. Smith Oil Tool Co., pick up badges

J. Hutchison, chief engineer, and C. G. Beisel, head development div., both of Exchange Lemon Products Company

Inspection Procedures and Frequencies

By BENJAMIN L. PEAK, Plant Superintendent, Sterling Electric Motors

IN SETTING UP a sound maintenance program there are many factors to be considered. The basic ones are:

1. The standards set up by management.

These standards are usually determined by managements' attitudes toward the general appearance of their buildings; their conception of the amount of maintenance labor they can support for machinery repairs, etc.

2. The type of machinery to be maintained.

For an illustration, textile machinery requires more maintenance per productive hour than a turret lathe, etc.

3. The product being manufactured.

A precision product would naturally require equipment of the same nature.

In order to plan an effective maintenance program, we broke the jobs down into the following basic categories:

1. The preparation of a realistic overall maintenance schedule prepared on a relatively long-term basis which would insure that all routine maintenance and inspection were adequately accounted for. 2. The daily issuance of work orders which assign to the proper personnel the individual task. 3. The setting up of maintenance records. 4. The size and control of the maintenance force. 5. The storage and security of maintenance parts. 6. The redesigning or improving of individual machine components to eliminate annoying and costly failures.

Storing of parts can be costly if not supervised properly. Adequate space should be provided so the piling of parts does not cause damage. There are many parts such as bearings, gears, etc., which should be wrapped tightly and stored in a dry place. If this type of part is stored openly it will in time accumulate rust, dirt and other foreign matter that will result in many parts being thrown away.

Cataloging of parts is also very helpful to your maintenance men. A well-designed cataloging system will reduce parts cost and save many hours of your men's time. Too often there are no records of supplies on hand. Maintenance materials such as electrical switches, tapes, electrical wire and many other types of materials disappear at a much greater rate than is suspected. Records of these materials will eliminate this condition.

Conference Statistics

Name: Western Plant Maintenance Conference & Show
Place: Conference at the Ambassador Hotel
Show at the Pan Pacific Auditorium
Registration: Conference—approximately 250
Show—approximately 7200
Producers: Clapp & Poliak, Inc. of New York—Saul Poliak and Ken Knowles
Publicity: Lykke-Wilkin & Associates
1720 West Ninth St., Los Angeles 15, Calif.
General Chairman of Conference: L. C. Morrow
Plant Engineering Representatives:
Dick Morris
Connie Grabb
F. R. Schalk
Jim Joseph

How Manufacturers are Improving Service and Maintenance Help

There's a lot of important and helpful information on all phases of plant engineering work that is not being utilized fully . . . Here's an example showing how one manufacturer is helping you get better results . . . many others are doing well, too; we'll report on them from time to time

NOT TOO LONG ago, as the ages of machines are reckoned, most manufacturers thought that it was unseemly—or at least unwise—to even consider the fact that their equipment ever needed maintenance, to say nothing of repair. Those days seem to have gone forever and we have arrived at the far healthier era that might be called the "Machines is only human" age.

Receipt, from Worthington Corporation, of a set of "Trouble Saver" bulletins brought to mind the fact that we had never apprised the readers of this trend although we are sure that most of them, being awfully smart guys, had already noticed this improvement in manufacturers' literature.

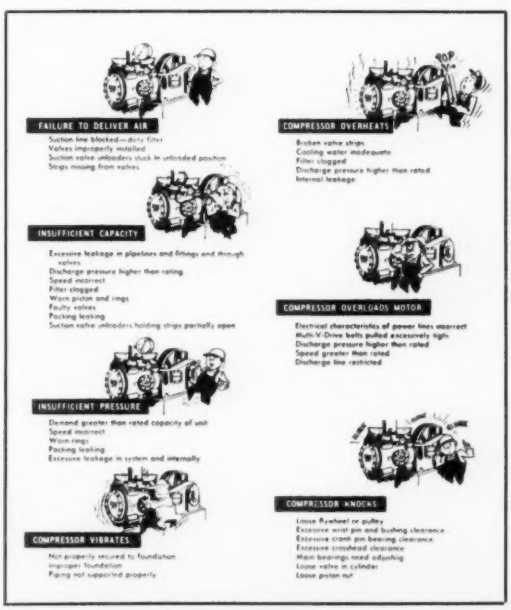
There have been issued thus far by Worthington, to be specific, a fairly comprehensive series of these particular bulletins covering, centrifugal, rotary, regenerative turbine and steam pumps, and water-cooled and air-cooled air compressors, and vertical water-cooled air compressors.

Copies Available

In fact, if you would like copies of any of these, write specifying bulletins PC-305, PC-306 or L-676-M1, respectively. Or, you can use one of the postage-paid cards elsewhere in the issue and write the same bulletin numbers at the bottom of the card.

FAILURE TO DELIVER WATER
Pump not primed
Insufficient speed
Discharge head too high
Suction lift too high (over 15 feet), check with vacuum gauge
Impeller passages partially clogged
Wrong direction of rotation
INSUFFICIENT CAPACITY
Air leaks in suction or stuffing boxes
Speed too low
Total head higher than that for which pump is rated
Suction lift too high (over 15 feet), check with vacuum gauge
Impeller passages partially clogged
Insufficient suction head for hot water
Mechanical defects
Wearing rings worn
Impeller damaged
Internal leakage due to defective gasket
Foot valve too small or restricted by trash
Foot valve or suction pipe not immersed deeply enough
PUMP OVERLOADS DRIVER
Speed too high
Total Head LOWER than rating — pumping too much water
Liquid pumped of different specific gravity and viscosity than that for which pump is rated
Mechanical defects
Shaft bent
Rotating element binds
Worn bearings
PUMP LOSES WATER AFTER STARTING
Leaky suction line
Water seal plugged
Suction lift too high (over 15 feet)
Air or gases in water
INSUFFICIENT PRESSURE
Speed too low
Air in water
Mechanical defects
Wearing rings worn
Impeller damaged
Internal leakage due to defective gasket
PUMP VIBRATES
Misalignment
Foundation not sufficiently rigid
Impeller partially clogged, causing unbalance
Mechanical defects
Shaft bent
Rotating element binds
Worn bearings
Vaporizing in suction
Excessive Capacity

The little man in the sketches at the left is just a symbol of the frustrations that maintenance problems often bring. Check lists like these can be of inestimable help, particularly for the younger mechanics and maintenance men. The one at the left, for example, is from a series of "Trouble Savers" published by Worthington Corporation, designed to reduce costs of plant operation by helping to more quickly locate trouble spots and then know the cure



At the right is a reproduced page from another of the "Trouble Saver" series, this one on troubles that might possibly arise with your installation of water-cooled or air-cooled air compressors

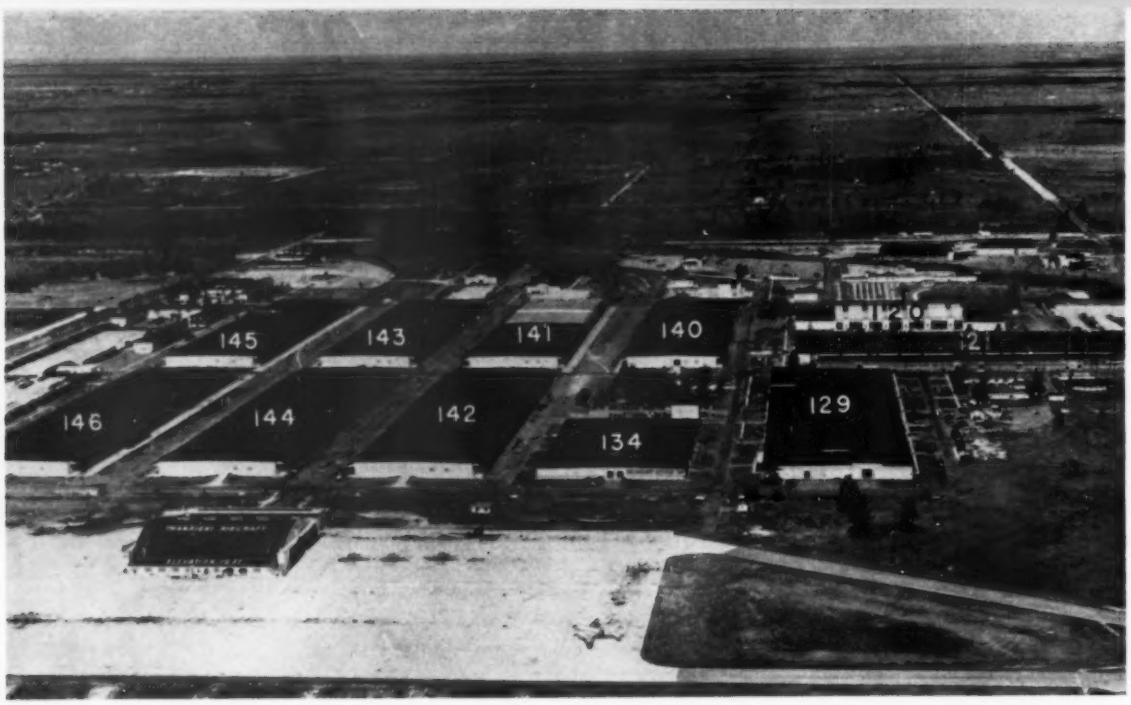


Fig. 1. This aerial view of the Component Overhaul Base—C.O.B.—shows just a part of the entire Miami Base. Identification: 120, engine test stands; 121, engine overhaul; 129, accessory overhaul; 134, plant engineering shops and offices and communications center; 140, general warehouse; 141, general shipping and receiving warehouse; 142, general files storage and air freight; 143, 144, 145, and 146, Dade County Port Authority. All of these are subject to pest control

How to Get Your Money's Worth from EXTERMINATOR SERVICE

By WILLIAM ADAMS, Plant Engineer, Pan American World Airways Base, Miami

PICK OUT ABOUT 30 acres of land anywhere, and it's apt to be inhabited by ants, roaches, beetles, termites, mites, fleas, flies, lice, mice, rats, bees and pigeons. Put this same acreage under roof such as the buildings housing Pan American World Airways Base at Miami, Florida, and even if the floors are concrete and walls and windows abound, a certain percentage of the population indigenous to the soil will be included. Even when completely cleaned out, such uninvited guests have means of entry all their own, throughout 880,000 square feet of buildings.

The pests listed above are mentioned specifically as they have required either special or continuing control measures at the Miami Base. This plant is not unlike others found in outlying industrial areas throughout the United States; but an airfield is a "field," and the fact that there is over a mile of grass cover for insects and rodents, between the Pan American field and the Component Overhaul Base buildings, merely emphasizes the problem.

It is one of the reasons why we employ a professional exterminator service.

Before we contracted the Orkin Exterminator Company, headquarters, Atlanta, Georgia, (operating in the South, most of the Southwest and Middlewest) we were being over-run with rats throughout our Component Overhaul Base (C.O.B.) buildings.

Some Smell a Rat

Rats can be a costly problem. One cost us $180 in cleanup labor and lost time when he got caught in a generator motor. Another got shorted in a power carrier — 20 ft above ground. It took some time to find him.

When aircraft seats are being overhauled, if upholstery is not stripped off and cleaned promptly, the rats would eat it because food had been spilled on it. A pilot's control panel, on which coffee and orange juice had spilled, was brought in for repairs; rats got on it, urinated on some of the equipment and corroded it. Rats also ate the insulation off a cable.

But the most fascinating thing to the rats were the screen wire cages built throughout the radio repair room — to guard the test equipment and keep out static. How to get in, and to run over the top and around between the cages interested them. Canvas, to protect the equipment in the cages, should the roof leak during a hurricane, was once left unrolled on top of some of the cages.

"Not too long afterwards," C. A.

Fig. 2. Wood supports are usually termite-free until concrete base crumbles, offering route for termite travel; then columns are bored and termite treated

Fleas and bees, mice and lice, these are but a few of the pests that must be continually controlled at this sprawling base . . . They have found that it takes an expert, with the best tools, traps and poisons to control them . . . The best costs them money, but it saves them money, too

Engman, Assistant Foreman in this department, pointed out, "we became troubled with fleas. The canvas on top of the cages where the rats played had become infested with fleas — from the rats—and these were dropping through the wire down on the workers." Spraying the canvas, rolling it up and storing it, ended that invasion.

Since then the rat problem has been brought under control and rats are seen as seldom in the radio repair shops as horses on a mid-town metropolitan street.

B. P. Kolkana, Orkin's District Manager in the Miami area, has been a Chairman of Rat Committees in Dade and adjoining counties. His men are trained to work on the premise that rat infestation operates on a cycle. Assuming maximum infestation "now," as everyone poisons, traps, and shoots them, the rat population decreases until only ten, or two, are left in the area. Everybody relaxes and the rat population increases again to a new peak.

"Anyone can get the first hundred, but to get the last ten," Kolkana states, "requires all the skill and special methods possible."

That's about where the rat problem is now at C.O.B. Possibly, in each building, Rat Control is being exercised to get the last two, or ten.

William Carter, Orkin's exterminator, services C.O.B. once a week. Rats have been brought under control by providing "stations" in corners, along walls, near soft drink and other vending machines, where warfarin cornmeal and sometimes water with a little arsenic in it is provided the rats. The Warfarin cornmeal will not kill a rat at the first meal, nor make him sick, but if he comes back for several meals it will kill him. And that is the point. If a rat sees another rat eat—and live — he'll eat, too. Another reason for using warfarin cornmeal is that if a man accidentally ate some, it wouldn't kill him, unless he continued the diet.

Cooperation Necessary

Plant maintenance cooperation includes the following: dogs, cats and small children should not be allowed to run loose in an industrial building where rat control is being carried out; if the warfarin cornmeal—or the arsenic water—gets spilled it should be cleaned up. Rats are sometimes finicky, refusing to eat spilled food, particularly if there is something else to eat not too far away.

Sometimes it's necessary to give the surviving rats what they are used to eating: poison an apple core in a waste basket, or some scraps of refuse in a garbage container.

Rats often take to beams and pipes, and to roofs over plant office enclosures. Strategic trapping and different methods of using poison (no one but the exterminator is apt to be on the office roof) can be employed to insure results.

The problem is now down to a point where it's necessary to hunt the survivors and outwit them. Which doesn't mean the exterminator can leave. Manager Kolkana makes this point—when the rats disappear, the mice are apt to come in. They seldom operate in the same area, although families of mice may breed in a sheltered spot and never go more than 20 ft from their nesting place. If there is a source of food and water in the area, they've been known to live within a 10-ft radius.

That's one reason mice can be handled in a special way: wherever they obviously have a run (droppings), or have made a hole, powder is spread along the run or just inside the hole. This powder gives the mouse a "hot foot" after he walks in it. He licks his feet and the powder poisons him.

Here, again, is where cooperation on the part of maintenance crews is essential to prevent the exterminator's work from being wasted. If a floor is hosed out, or swished out with buckets of water, the mice control materials

Fig. 3. These enclosed, screened radio repair areas intrigued the rats until pest control was exercised. Rolls of canvas, used to protect the equipment beneath, were spread over the tops of the cages just in case the roof should leak during a hurricane. Rats played on the canvas and the canvas became infested with fleas from the rats. The fleas then began to drop down onto the workers. Spraying the canvas, rolling it up and storing it until needed, eliminated this nuisance

Fig. 4. Roaches and palmetto bugs eat fabrics. Here, where pillows are stored and repaired in Building 129, William Carter checks for their eggs and nests

go out with it. The mice need an opportunity to run—at least one night—for the control to work. Certain standards of cleanliness in our plant restaurants had to be suspended to get rid of the mice. (At the beginning, the main kitchen had to be closed down for one day to bring the rat problem under control.)

Unless folders, pasted clippings, posters, glue and brushes are stored in vermin-free vaults, and kept under control, such storage attracts bugs, rats and mice. It makes good nesting material. Stationery supplies should be stored so they keep moving to use, so no forgotten areas develop into breeding grounds for pests.

Ants in the Plants

Chlordane powder around the building adjacent to eating places, keeps the ants down. Being Florida, there are sizeable red and black ants—and a variety of small ant that travels in single file columns from here to almost anywhere.

Nylon cement used in patching Flytex lining of rubber and nylon aircraft gasoline tanks attracts the ants. Such work areas have to be sprayed and sprinkled to keep ants out. A jelly in small containers is put out for ants also. In eating places a general spray is used for ants and roaches.

"We try to keep the pests down to where complaints turn into cooperation," exterminator Bill Carter reminds. "But with all outdoors to recruit from, you never get the last one."

Shrubbery up against a building provides wonderful ladders for ants. Keep shrubbery down, and landscape away from the buildings. Have ground crews wipe out ant hills with poisons.

The polite name for a Florida cockroach is Palmetto bug. He's big, often 2 in. long and loves to eat your new suit. What with the German roach and some other insect nationals, the roach is the most prevalent problem in Florida, with rats running second.

The Palmetto's diet includes the loud speaker cones in radios; book binding tape in the Executive Office Building had to be canned to take it off the roach menu. Sometimes a Palmetto will display a normal appetite and get into a dispensing machine. Colas are a favorite drink.

It's around the drink dispensers and behind food vending machines that they can be most easily poisoned. Coffee spoons, cups, candy wrappers, thrown in some inaccessible cranny attracts German roaches. No matter how narrow, the spot is never inaccessible to him—as a breeding ground.

Plant cooperation requires maintenance men to keep such places cleared out, and to urge all employees to discard such items in containers always provided near the dispensers.

Wood Workers

Termites of two types have been found at work and stopped or controlled.

Dry termites were found in some desks. These, of course, could be moved by the exterminator to a gas chamber, treated and returned termite-free.

Unfortunately, the "wet" termites found in the wood supports of one building presented a different problem. These termites will make mud tubes up a stone wall to reach a wood roof or second story floor. In these mud runs their activities are concealed until they enter wood. Such runs were present in this building, but were harmless because termite shields at the top of the outer stone wall prevented the termites from going into the wood.

The concrete blocks supporting the wood columns had begun to crack and crumble in some instances, and through these cracks the termites came up into the wood column. This infestation required drilling and treatment inside the columns to eliminate the pests.

In the war against termites it is possible the ants help, as they will eat termites; but the termite that does the damage is a worm. Termite control requires vigilance on the part of inspection and maintenance crews—and special handling by the exterminator.

With planes coming in almost hourly from Central and South America, it is not surprising that we sometimes uncover a hardy breed of pest.

Such was an infestation of a type of carpet beetle that had its origin in a huge box shipped in. When discov-

Fig. 5. Mrs. M. (Ma) Avery in storage room for repaired and renewed hostess and steward uniforms. Everything must be cleaned before it can enter here

ered, the beetles were beginning to migrate, and these were of a kind that would leave nothing of your coat but the buttons.

Sprays and powders would of course do no good as they would only get the bugs on the move—at the time. Fog was tried, and the whole room filled with it. But tightly packed crates and boxes are almost impenetrable. Finally, the necessary precautions were taken and methyl bromide gas was used and the infestation ended.

Such a pest could quickly cost the company thousands of dollars. But there is a financial limit on how far to go with preventive means. In some instances if enough pesticides were used to prevent the spread of anything—no human being could work in the room either. Frequent inspections of all areas, dead storage, every cranny; prompt, scrupulous maintenance and cleanliness; early reporting of anything that indicates pests is the only balanced answer.

An example of what can be done is the Upholstery Shop which has been moved into more finished quarters, suitable for handling and sewing materials.

M. H. Patterson, Assistant Foreman, recalls that in the old building, on a ground floor with corrugated construction, rats, roaches, and other bugs were more a problem. In a remodeled building, on the second floor, with finished walls and floor, routine pest control and maintenance has eliminated the problem.

Anything that has ever been used is dry cleaned before it is brought in. Here Pan American's seats are upholstered. Materials are kept in the open—not stored.

Floors are kept swept, morning and night, to avoid infestation of fleas which often breed in lint from materials such as wool.

Stewards' and Hostess' uniforms are checked, repaired and re-made to fit, by Mrs. M. (Ma) Avery, who has been at that job ten years for Pan American. Anything spilled on these clothes could attract pests, so they are dry cleaned before being worked on or hung in the wardroom.

Unsolved Depredations

Two problems in pest control have not been satisfactorily answered—yet. One is pigeons; the other is bees.

Attracted by sugar, the bees at times infest the area where men drink their coffee. The snack bar has been screened, but if the men eat outside the enclosure, the bees are still there.

Sometimes a man drinks a bee. Beemen say that a bee full of sugar is harmless. Further, that bees fly only 3 miles from their hive and wouldn't go that far if there was enough food closer home. Calling an exterminator doesn't help because the bees are gone by the time he gets there.

DDT and other contact poisons, sprayed on bees, kills them, but as the bees aren't there unless the men are, it might also get on their drinking cups.

Pigeons are a worse problem, and some headway is being made here. A law makes it illegal to poison them, and if they are shot, the bullets make holes in the roof. At present, trapping the pigeons is being seriously considered.

Two agencies are behind the law making it illegal to poison pigeons, and both these agencies will help an industrial firm attempting to trap pigeons. The Humane Society will accept trapped pigeons, and dispose of them without letting them go; and the Pigeon Clubs of America will supervise the construction of a trap that will take hundreds of pigeons, provided the company will build it and pay the cost.

The principle is to make a hole in the building near a roof eave where pigeons congregate, then build a large cage inside the plant just under the roof. Spread grain for the pigeons to eat, and for a day or two allow them to go in and out—until they become used to the cage. Then fix a slanting board from the top of the hole in the wall, down to the cage floor, so they can come in but cannot fly straight out—for the board doesn't permit them to extend their wings at the point of exit. Take out only half the birds each day and leave the others for decoy. In

(Continued on page 202)

Fig. 6. On the other side of this mouse hole is the dining room. William Carter is sprinkling "foot powder" for mice in passage between office and restaurant

Fig. 7. Those white lines up the stone wall are termite tubes. These are built of mud and make it possible for the termites to travel until they hit wood

Safety Organization and Procedures with Electrical Hazards

First, set up a good safety department; second, establish a safety rule book; third, make certain that both department and book are operable . . . Author gives details on plant operating safety in electrical testing procedures

By C. E. MERRIS, Laboratories Department, General Electric Co.

SAFETY OF PERSONNEL exposed to electrical and related hazards in manufacturing is a matter of mounting importance and concern to management as well as to those actually exposed to the hazards from electrical circuits. The very nature of the danger makes it all the more difficult to guard against and requires the closest attention of men familiar with testing and operating conditions, often requiring technical background and engineering guidance.

Probably it is safe to say that the most important factor in safety is the human element. Equipment design, safeguards such as insulating barriers, interlocked gates, signs, posters and the like are important and are not to be dismissed lightly.

"Safety is Everybody's Business," is a good slogan. This must be taken literally by all elements of supervision. Nothing is more deadly than to permit a feeling to grow that management has only a lip service interest in safety, that it procrastinates and doesn't make certain that unsafe conditions once reported are corrected with vigor.

That, then, is one of the human elements involved. Looking further, examination of the facts surrounding an accident will show the fault to lie in one, two or three zones. Only one zone may be involved in some cases, two in others, sometimes all three must share the blame. They are: 1. The fault of the victim; while this is usually present, it seldom is the only one of the three. 2. The fault of the victim's fellow workers. 3. The fault of management.

At this point it may be helpful to center our thinking around a problem. Let us assume we are faced with a situation where there is a poor safety record and we are determined to correct it. Supervisors of operations where accidents are occuring report that their people are just dumb, or unbelievably careless, or don't follow instructions. What's to be done? Fire a few offenders? Give certificates for good safety records by groups? Flood the place with safety posters? Plaster safety slogans over the pages of the company newspapers?

Some or possibly all of these may be good in certain cases but they are not fundamentals and by themselves

Fig. 1. Dead-front test equipment such as this portable test truck should be employed whenever it is possible

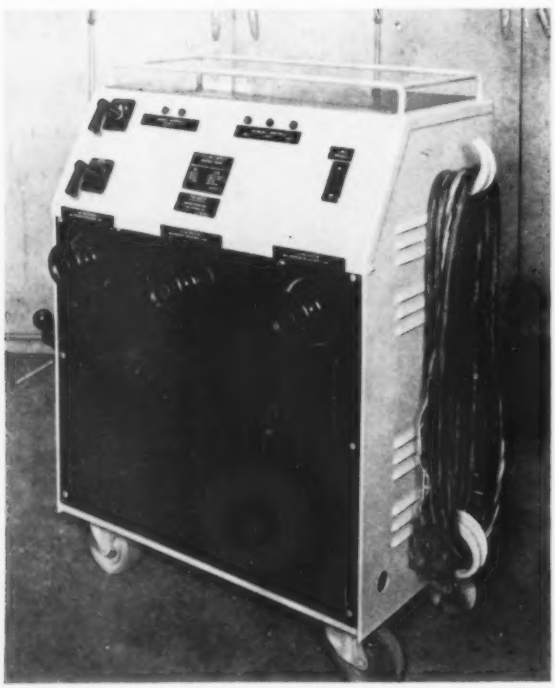


Fig. 2. This dead-front bench for testing relays contains all of its live parts within its steel insulating housings

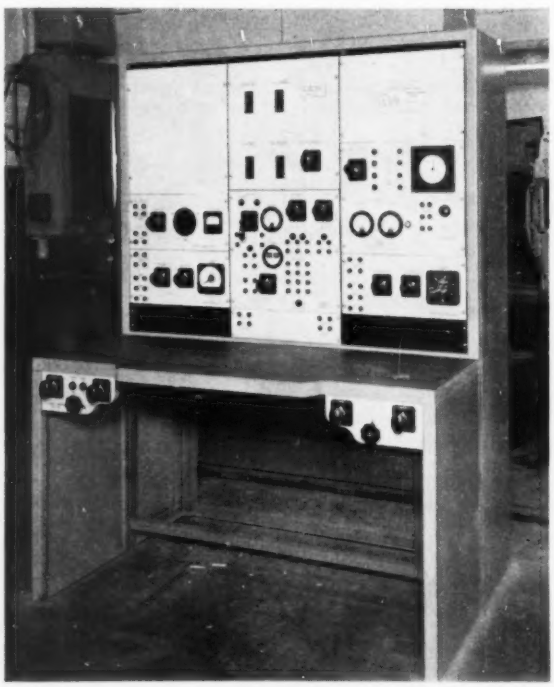


Fig. 3. Note the tape and the warning signs surrounding this typical test set-up for applying 36,000 volts to a bus assembly

will not show any very gratifying results. Safety must go deeper than that. It involves a basic human element. For the best safety performance we must make people want to do things the safe way. That sounds so very simple.

Safety Program

No one wants to get hurt; ergo, everyone should want to work the safe way! The tester or electrician is probably saying to himself: "Who says it is the safe way? I think my way is just as good. I'm careful. I've been doing this job this way for five years. I have to make my day's pay. I can remember to keep my hands off "hot" metal and to stay clear of high voltage and all that." Therefore, we must create a desire to work safely and also to convince the worker that our way is the right way. Here are several steps which have been found helpful in creating this atmosphere.

a. This selling must start before the new man is put to work. Some of it may be done in the personnel office, but certainly the foreman or supervisor himself should handle the more hazardous aspects. Giving information may require short discussions several days in succession. In fact it is a continual process, for people will forget.

b. Fellow workmen can play a very important part in this information process, and they should be urged to assist. Often times their testimony is more effective on some points than that of the boss.

c. For repetition, ready reference, and emphasis a booklet of condensed rules worded in simple, easily understood terms is essential. Always tell the man why, supplementing the rule book by personal discussion between the man and his supervisor.

d. Closely associated with "c" are such things as posters and prominent warning signs mounted at strategic locations. Posters should be changed frequently. We have a way of being lulled by familiarity.

e. Publicity in company newspapers helps to keep alive an interest in safety. It should be maintained, rather than spasmodic with long lapses between articles.

f. Get workmen to participate. Make them feel they are "on the team." Hold occasional group meetings to discuss accidents and near accidents, hazards of new operations, newly installed equipment, etc. People must be made to feel that their participation is a necessary ingredient of safe working. If they realize that by helping the new worker, they are helping themselves, they will more clearly see the benefits of over-all safety.

g. Appoint a committee on safety in each crew. Hold meetings at regular intervals. Each item reported should be given a reference number and carried on the agenda until properly disposed of. Such participation by the people is invaluable. Items will appear of which the foreman has no knowledge, or, since he too, is human, has completely overlooked. Rotate the membership every three to six months, thereby securing wider coverage of the group. Free committee members occasionally to make an inspection of the equipment and practice connected with the work of the group represented, reporting their findings at the next committee meeting.

h. Frequent drills in resuscitation, where all participate, is essential. To be effective in an emergency the operator must be so thoroughly familiar with the technique that he proceeds instantly and smoothly with the task without becoming confused and losing precious minutes.

i. Recognition of good safety records by awarding certificates, plaques, etc., helps to maintain interest in safety activity by its appeal to pride. However, such awards cannot be relied upon to correct basic shortcomings.

Safety Committees

Basic rules and major inspection procedures should be set up by people who have the necessary technical knowledge and, equally important, actual experience.

Nearly 30 years ago a central committee, known as the Interworks Testing Safety Committee, was set up in one large electrical manufacturing company, charged with the responsibility of preparing rules, studying

conditions, analyzing the causes of accidents and near accidents, supervising the design of testing equipment, conducting safety inspections, etc. Membership is composed of testing supervisors, men who know the game and are in intimate contact with testing operations.

The committee has been actively supported throughout the years by management on the executive level as a continuing and essential instrument of policy-making activity. Among its early activities was the preparation of a book of safety rules which has been constantly revised and enlarged to meet changing conditions.

Hazards in New Fields

Expansion of manufacturing into new fields such as jet engines, radioactive components, electronics, etc., required much study to determine how people can do their work safely. The field has spread from motors, generators, transformers, turbines, switch gear and similar standard lines to include hazards arising from new fuels, chemicals, machine gun controls and more recently atomic radiation, to name only a few.

Mechanical forces of all kinds, tremendous rates of acceleration, noise—all these and many other factors are attended with hazards.

This company's enviable safety record in the testing field is a tribute to the success of its safety committee's activities. Its Safety Rule Book is reported to be among the most authorative treatises on safe electrical testing practice in the industry.

Protective Equipment

Having made progress on employee attitude, management endorsement, and codification of safety rules to guide people, our attention turns to the tangible features of testing equipment. Literally hundreds of expedients for protecting people have been suggested and used. Among these, to mention only a few, are; protective facilities such as safety enclosures with interlocked gates, temporary guard rails and walkways, tools with safety features, warning devices, and emergency equipment such as fire extinguishers, chemical neutralizers, and emergency showers.

In considering electrical protective equipment it is necessary to first decide the lower limit of dangerous voltage. Shall we start insulating exposed parts and protecting people at 50 volts? 115 volts? 440 volts? What is a dangerous voltage? We know that 115 volts is lethal in many cases for we read frequently of fatal accidents from this voltage in our daily papers. People in bath tubs reach for electrical appliances. Other people on wet cellar floors grasp "hot" wires or energized metal cases of washers, etc.

Electrically driven lawn mowers and car polishers take their toll of lives. All on 115 volt circuits. There have been rare cases where 60 volts appeared to cause death and one instance at least where 48 volts was pronounced responsible for a fatality. On the other hand, a safety expert has to be reasonable and just sees no practical way to entirely protect people against the possibility of getting shocked at 115 volts. Where are we going to start in the voltage scale?

We must recognize that it is current that causes injury or death, that under a fixed set of conditions the voltage is a yardstick only insofar as it affects the current flow. Another factor is body resistance which varies widely. The path of current through the body, the length of time the shock persists, and other conditions also have their bearing.

The concensus appears to be that:

a. Five milliamperes is too small to cause injury although like the "kick" from a spark plus this much current at 2000 volts or higher can be extremely uncomfortable and the resulting muscular reaction might cause a man to fall from a high place.

b. Eight to 22 milliamperes is about the limit of "let go point" for the average man and hence must be considered dangerous, possibly lethal, under certain conditions.

c. One hundred milliamperes can be expected to cause fibrillation of the heart.

d. One ampere or more is almost sure to produce a block in the nervous system and fibrillation may be set up also.

From the data made available by many investigations, particularly the papers listed above, it is concluded that a testing source whose output through short circulated leads is limited to not more than 5 milliamperes may be used by properly instructed people in the course of open bench testing and without barriers, interlocked doors, etc. If the output can exceed 5 milliamperes operation should comply with rules covering high voltage installations.

However, the greatest number of electrical sources are classified as "low voltage," particularly 115 volts. Considering the variables just outlined it becomes apparent that we cannot say arbitrarily we must protect against 48 volts or 60 volts or even 115 volts in all cases. At 115 volts or less, the hazard to people standing on dry wooden floors may be very remote, whereas in damp cellars, plating rooms, in boiler shells, etc. where the ground resistance is negligible and area of skin contact large, the hazard may be extreme. To the experienced safety man good judgment will dictate what should be done about 110 volt hazards. Two hundred and thirty volts is of course more hazardous, though under certain very favorable conditions it has been considered by some as not requiring any particular safeguards.

"Fool Proofing Equipment"

There can be no question that voltages in the 440 to 750 range which are often used for control apparatus, are dangerous if the sources will permit more than 5 milliamperes to flow, and should be guarded in every practical way. Anything above 750 volts is generally classified high voltage and good judgment demands that such circuits be surrounded with all the safeguards associated with high voltage.

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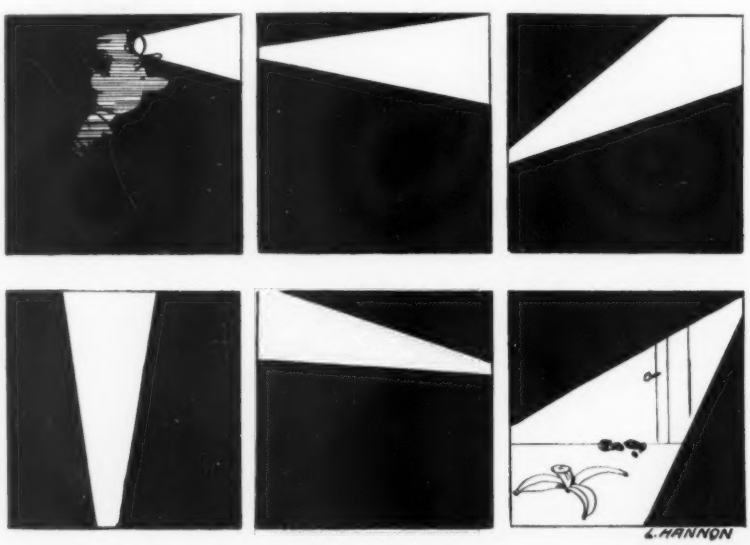

Fig. 1. Aerial view of the tin plate mill. Automatic fire-quenching units, a ventilated motor room and a tie-in with the waste-water reuse system of Kaiser's hot strip mill are just a few ideas which have been incorporated in this mill

Tin Cans Come Out of the West . . .

. . . in increasing numbers, thanks to Kaiser Steel Corporation's tin plate mill at Fontana, California . . . Interesting construction features of this plant include louvered walls, nearly flat roof and corrugated plastic window sections

STATISTICS had a lot to do with locating Kaiser Steel Corporation's tin plate mill in Fontana, California. The West Coast has built up one of the largest tin can industries in the world around its multi-billion-dollar agriculture, packing about 85 per cent of the nation's canned fruit and 30 per cent of its canned vegetables. The entire output of this plant will become cans—much of it destined for West Coast consumption. This is the West's second tin plate facility.*

Equally important, the mill is located near Kaiser's hot strip mill, from which it receives its raw materials—hot rolled strip steel. The 9-acre production facility, privately financed at a cost of $25 million is producing some 200,000 tons of tin plate annually. It is supplying about 25 per cent of the West's 875,000 ton annual requirement for tin plate.

Plant engineering-wise, the plant features: (1) wooden flooring in heavily traveled production areas; (2) a nearly flat roof; (3) plastic in place of glass for the window area; (4) long runs of louvered walls for maximum ventilation necessary in a process involving various oils and acids; (5) a totally enclosed, ventilated motor room, whose units power a five-stand cold reduction mill; (6) individual carbon dioxide automatic fire-quenching stack units, geared to blanket fires which could originate in the seven stacks, dissipating fumes from hot dip tanks; and (7) tie-in with the waste-water reuse system of Kaiser's hot strip mill.

Waste water from the tin mill hooks into Kaiser's water-reuse set-up (PLANT ENGINEERING, Nov., 1952, page 83), but with special qualifications. Tin mill water quality is strict, yet the quality of its effluent is low. The waste contains high concentrations of sodium compounds which cannot be spread on the ground because they would endanger the underground supply. Because of this, Kaiser engineers have segregated the tin mill effluent into two systems: motor room and tin process circuits.

Motor Room Circuit

The motor room circuit is closed, the only contamination being a build-up of solids from evaporation in the cooling tower. The motor room circuit is part of the system from one of seven cooling towers located at the plant.

In this water reuse scheme, water from the tower circulates through various motor rooms (including the tin mill's) and reheating furnaces in series—not in parallel. This means that water is progressively heated from a cooler to a hotter process (thus greater heat exchange during cooling) until it is finally returned from a sump to the tower for re-cooling.

Thus, cool water is first put to work cooling the various motor rooms. Then it flows in series through the reheating furnaces (used to heat steel for rolling). This is a closed system, save for make-up and blow-down. The blow-down from the motor cooling tower supplies make-up for the next tower in line.

The tin mill process circuit, more complicated, separates the process effluent into two sub-circuits: (1) pickle liquor and (2) alkali water. Alkali water is pumped via 6- and 8-in. steel lines to two, 10,000-gal storage tanks (both above ground at the tin mill's northwest corner). From here it is moved by two 15 hp centrifugal pumps to Kaiser's blast furnace slag pits. The alkali water is not reclaimed; it is used to quench the slag.

Meanwhile, pickle solutions are neutralized, passed through clarifiers, sand filters and carbonization basins and returned to the tin process circuit. This split process system conserves water, reduces pollution hazards.

The tin mill building is interesting because it contains no glass windows. Instead, runs of green-tinted corrugated plastic let in light. Kaiser maintenance men say this will greatly reduce breakage and maintenance costs.

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* Columbia Steel Corp. has a tin mill at Pittsburg, California.

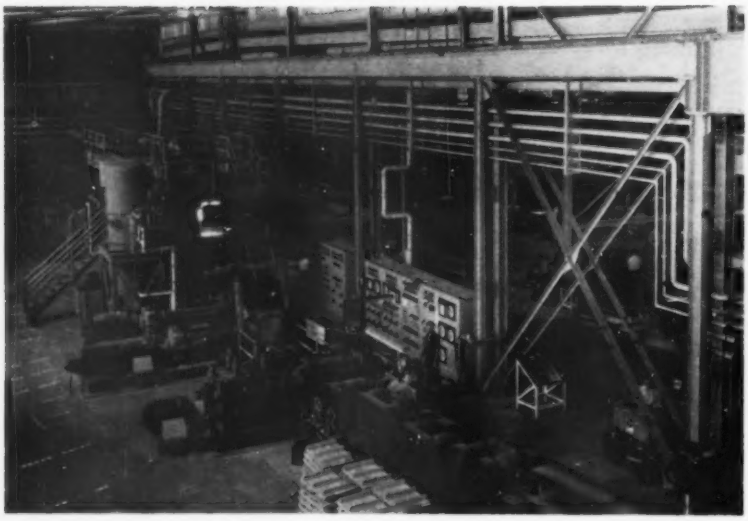


Fig. 2. Another interesting feature in this tin plate mill is the piping layout. Note how the piping is strung vertically between the plant's bay supports

While corrugated plastic window sections vary dimensionally throughout the plant, a typical section is 632 ft long and 8 ft 6 in. high. In one case a sidewall begins at the roof with a section of corrugated steel (20-22 gage). Below this is an 8- to 9-ft section of corrugated plastic, then more steel, and finally a 13 ft high (170 ft long) area of chain-operated metal (18 and 20 gage) louvers.

Louvered Ventilation

Louver sections are generally 4 ft long and there are as many as 42 of these along one wall alone. Cross ventilation, louver-supplied by this radical design, is necessary considering the various acidic processes. Ventilation is engineered to dissipate such combustibles as palm oil fumes which are used in hot dip and finishing processes.

Extensive use of palm oil, moreover, is responsible for installation of carbon dioxide fire-protection systems in the seven stacks venting hot dip lines. A Cardox storage tank (capacity: 10 tons) is located in a basement adjacent to the hot dip lines. It supplies carbon dioxide protection, individually, to each of the seven stacks. Warning lights and horns complete the fire-fighting equipment. Water cannot be used because of the high volatility of vaporized palm oil and other hot dip solutions.

The tin mill's roof, in general, is of double corrugated steel construction, with 1 in. of insulating material sandwiched between corrugated layers of steel. This design effectively reduces (even prevents) condensation and subsequent danger to delicate tin plate from roof drippings. Throughout the plant, design factors point to an effort to reduce or completely eliminate condensation and its detrimental effects upon tin plate.

Visitors at the mill are surprised to see runs of in-roof ventilators which from casual observation, would seem to allow entrance of rain. Actually these ventilators are uniquely designed to let air in, yet keep moisture out. They consist of sheet metal louvers so angled and overlapped that water drains from them into gutters surrounding each ventilator. The run-off, thus collected, is conducted to the roof drain system.

Another feature of the mill is the wooden flooring. Tar-block Douglas fir flooring, designed primarily to ease foot strain and to carry heavy loads carried by forklifts, is installed in process sections where women employees work. This includes the sorting, gaging and hot dip as well as other areas. Load consideration is another factor. It's not unusual for a lift load to weigh 3500-4000 lb.

Kaiser maintenance men claim that the wooden flooring, made from 4 by 6 by 2½-in. creosoted blocks of Douglas fir set on grain-edge, can withstand greater loads with less maintenance. Blocks were set on a concrete base, sunk 2½ in. below floor grade, and held in place by tar. The packaging section, which eventually will have the same wooden flooring, was constructed with its concrete surface 2½ in. below proposed floor grade—so that in time, the blocks may be set. Probably one-fifth of the plant's total floor area is wood.

Power for Reduction Mill

The motor room, totally enclosed from the five-stand cold reduction mill it powers, contains two motor-generator sets with a total 11,400 kw output which in turn drives the five units (three of them tandem hook-ups) powering the five-stand reduction mill. Typically, Stand No. 1 is powered by a 1500 hp motor with a 1200 kw generator. Stands No. 3 and No. 4 each are powered by a tandem set-up consisting of two 1500 hp motors (their armatures on the same shaft, for a total 3000 hp) driven by a 2400 kw generator.

Beneath the motor room is a basement whose primary function is to cool and ventilate the motors and motor room. Two fan rooms in the basement, for example, cool the two motor-generator sets. Air is sucked through the motor-generator sets, is cooled in the basement through a four-section cooler (66,000 cfm), then through a double fan (33,000 cfm, 3½ in. static pressure each). Cooled air exits via a hatch into the motor room, where the process is repeated. Make-up air enters the basement make-up fan room through a 14 ft by 10 ft 4 in. by 1¾ in. filter, with a capacity of 46,500 cfm.

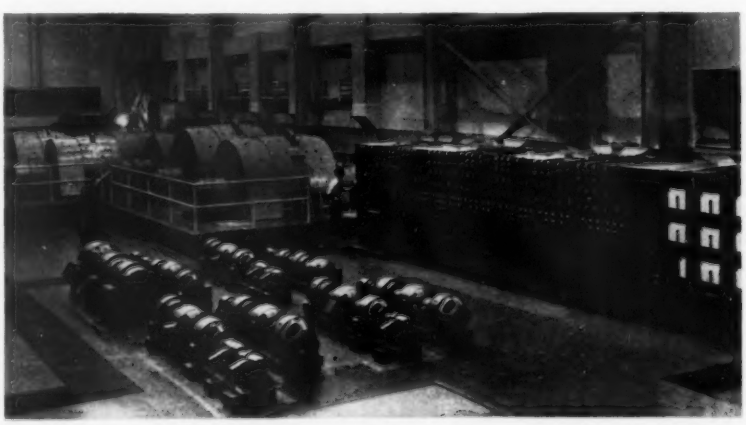


Fig. 3. Motors in the background of this ventilated motor room drive the five-stand cold reduction mill. Note the venting along wall in background and at right

Fig. 1. This photograph shows the removal of bolts from exchangers by means of a pneumatic gun. In this operation four such guns are used simultaneously; only one gun was being used in this photograph to give detail to the photograph

Scheduling and Conducting An Oil Refinery "Turnaround"

Pre-planning and proper scheduling of all items, along with complete cooperation of all departments during the turnaround period is what makes for quick, safe and economical preventive maintenance in a refining plant

By NILS B. BENGSTON, Mechanical Superintendent, Everett Refinery, Esso Standard Oil Company

THE OPERATION of a "turnaround" includes the shutting down of a unit, cleaning, inspecting, repairing, changes as a result of inspecting, changes for unit improvements, preventive maintenance work and starting up of the unit.

Turnarounds are scheduled as far ahead as from 1 to 2 years. The reason for this advance planning is that all units are dependent on each other, and two units should not be down at once. There is a profit in keeping all units on and the decision on how the units come down affects the profit position.

After a unit has been scheduled to come down, letters are sent out to all departments in the refinery asking them to send in the orders they have for work with drawings and all necessary information to complete the job.

No work will be done unless it is written on a mechanical order form and approved by a department head or his assistant. We feel that if a job is worth doing, it should be formally requested. This rule is one of the secrets to the success of a turnaround.

As orders for work are received they are tabulated on a master work sheet. A description of the work is placed on the left hand side of the sheet and throughout the sheet we tabulate the crafts and equipment involved to complete the work. The number of manhours for each craft is also noted. This master sheet could have from 200 to 300 orders. When the sheet is completed, we have an idea of the total manhours necessary to do all the work. We have the number of manhours by crafts and an excellent idea of the mechanical equipment that will be necessary. The Everett Cat Plant takes approximately 30,000 manhours. Other refineries with larger cat plants could take up to 70,000 manhours, so that you can see that a turnaround of a cat plant could be a major operation.

Now with master sheets full of orders and in many cases more manhours for a scheduled shutdown period than can be supplied with your own forces on a straight eight-hour day, studying the turnaround starts in earnest.

Some five weeks before the shutdown these meetings start and the first question that is asked is—what can be done at the unit before it is shut down? Installation of staging, having replacement equipment ready, cleaning and repairing spare equipment such as pumps, motors, lines that can

be taken out of service, are some of the items which are studied. We also make a complete study to determine what jobs can be eliminated.

We also know that in preturnaround work we have found it advantageous to slow down a unit to clean heat exchangers. This reduces the work load during the actual turnaround.

Also, at this time we determine whether contractors should be called in to do specific jobs and whether we should work on scheduled overtime or if overtime should be confined to bottlenecks.

Scheduling and Directing Jobs

Next, a schedule of when jobs start, the crafts involved, number of men, and equipment needed is made up for each job. The men who work up this schedule must have many years of mechanical experience. He must know the jobs, the foremen and the capacity of the men in all crafts. Jobs must start and be completed as per schedule.

Once the work of each craft has been determined the task of assigning workers to these jobs and keeping things rolling is the next responsibility. The directing function is not to be associated with obedience, show of authority or discipline, but rather with getting people to act as desired. It is "setting" the crafts to work and keeping them working.

Better planning and organization calls for less direction and supervision, while poor planning and organization calls for more direction and supervision.

In all turnaround work, the workers must feel that they belong—that they are contributing "value plus."

The craft foreman is the man the workers look to for guidance, so he must be a good supervisor. He must understand that his job depends upon handling people, dealing with them sincerely, fairly and intelligently. To do this he must understand his people, and must be sympathetic with them and their problems. He must realize that results come through people, and management holds him responsible for handling the problems that arise.

Each day, at 2 o'clock in the afternoon, a meeting of all craft firstline supervisors and inspectors is held in the Assistant Mechanical Superintendent's office. Progress of the work up to that time, difficulties requiring corrections, assignments for the next day and other pertinent topics are discussed. Also, the decision is made whether to work on bottleneck jobs or to put crafts on shifts.

At the unit turnaround site we have other facilities to increase work efficiency. The co-originator of the turnaround has a 30-ft house trailer office. This equipment has office furniture, lights, heat, telephone and is connected to the refinery loud speaker system. From this office stems all the working of the turnaround.

Another 35-ft trailer is used as a tool room and storehouse. In this equipment are all the necessary small tools, safety equipment and some of the popular storehouse items. Several 1½ ton trucks are on the site for work. One truck is assigned only for travel to the main storehouse.

Although we have 19 approved smoking areas in the refinery, a special smoking area is usually set up near the turnaround site. A smoking

Fig. 3. Two craft foremen and the Construction and Maintenance Superintendent discussing next turnaround

period in the morning and in the afternoon is allowed. Coffee time is set up only in the morning, and coffee is delivered to the site.

Extra electric water coolers are set up so that the workers do not have to leave the job. Extra telephones are located in the upper platforms of the units.

We are purchasing a skip hoist to bring materials to high levels, and we hope to have a moderate speed elevator installed next year to carry men to all platforms.

Turnaround safety receives its first consideration at turnaround meetings. Careful work planning is one of the more important features of an accident-free turnaround. If several crafts are to work in different elevations of the same tower, work is planned so that, consistent with efficiency, as few

Fig. 2. Tabulation of work is made on master sheet. When finished, it may have 300 orders for the entire turnaround

MEGHANICAL CONTROL FORM

WANTED CAT PLANT TURNAROUND #23 — MANHOURS

I. D. O.	DESCRIPTION	MEN IN DEPT. / MEN AVAILABLE	ITEM YOU WORKED	PIPE	MACH	BOIL MAK'R	WELD	LAB'S	CARP'S	PAINT	MASON	PIPE COV'R	RIGG'R	ELECT.	INSTR	TRUCK	TRAC.	CRANE	FIRE WATCH	COMPL
										#1	#2									
1	Blank Unit			146					86			32								
2	Clean Frac. Tower			180				320	48					16					32	
3	Repair 15 Pumps -			96	640								48	83			x			
4	" Air Compressor			24	310								48	38	10					
5	Repair Reactor Shell					148	96		18					6				32		
6	Check Instruments on List			210	62	28	18		32			84		84	960	x				
7																				
8																				
9																				
10																				
11																				
28																				
29																				
30																				

	OVERTIME JOB ITEM	STATE: NO. OF MEN - TIME - GIVE DETAILS
1		#1 Painters to work with laborers
1a		
2		#2 Masons to work with Pipe Coverers
2a		
3		
3a		
4		
4a		

people as possible are in the tower at one time. Overhead work is planned so that it can be done when there is no concentration of workers directly below this site.

As each unit is taken out of service, all lines and equipment are water washed, purged with steam and then blanked at battery limits. Likewise all fuel and gas lines to furnaces are blanked. This blanking or "blinding" is very important because one can never tell when a valve may be opened or a pump started and oil or vapors may inadvertently reach a point where hot work is being conducted.

Before any vessel, line, fire box or other equipment is entered, a gas test and inspection is made to insure that the work can be done with safety. If hot work such as burning or welding is entailed then additional safeguards must be maintained. First a fire guard or "fire watcher" is put on duty. He has to see that all sewers in the area are sealed with an asbestos mat and 2 in. of sand on top of this.

In addition, he has a 2½-in. fire hose in readiness with the pressure right up to the nozzle. If the welding or burning is inside a tower, then an additional 20-lb carbon dioxide hand extinguisher is located along-side of the operator. Because much of the welding entails alloy rods whose fluxes develop toxic gases, manheads below and above the welder are removed and a fan is installed to exhaust these vapors.

Constant Check on Safety

As the turnaround progresses, a continual check is maintained to see that the workers are supplied with and are using the required clothing and protective equipment. Leather palmed gloves, safety shoes and "hard boiled" hats are required at all times. In addition asbestos "mitts" are provided for handling turbine hose when the tubes in the hot fire box are being turbined. "Hooded" respirators are used for cleaning catalyst or coke dust from trays in towers. End wrenches, socket wrenches, nut runners, explosion-proof extension cords are in continuous use on these units and frequent checks make sure they are in good condition. Much of the work is carried on from scaffolding erected from many of the elevated platforms.

A safety problem of ever-increasing magnitude is reflected in the growing use of contract labor to augment the refinery crafts during turnaround. Over the years our refinery crews acquire a natural awareness of the hazards which the confusion of refinery turnaround presents and once they have been oriented to the safety precautions they carry on quite well with a minimum of checking. On the other hand, contractors and their employees are usually quite unfamiliar with the restrictions required and continual surveillance must be maintained to see that safe tools are used and safe procedures are observed.

Storehouse operation is a big factor in the flow of needed materials to a turnaround. A good operation would have all the items that would be asked for and a "set up" by which non-stocked items can be obtained at short notice.

Fig. 4. Mechanical crafts' mobile office for foremen which is used during turnarounds. When no turnaround is in progress trailers are used on construction jobs

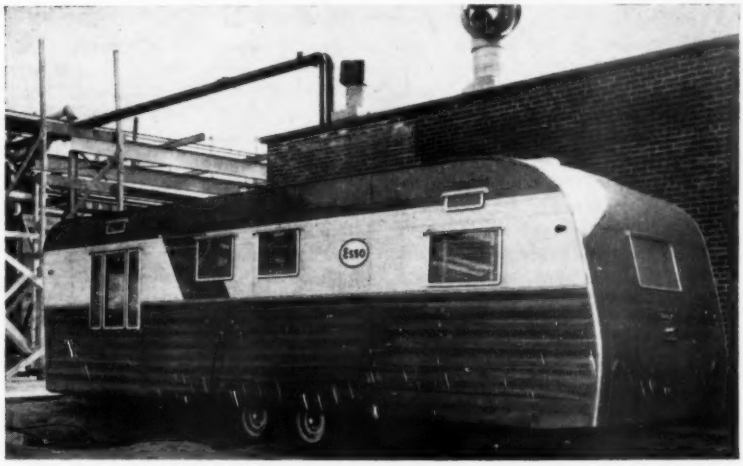
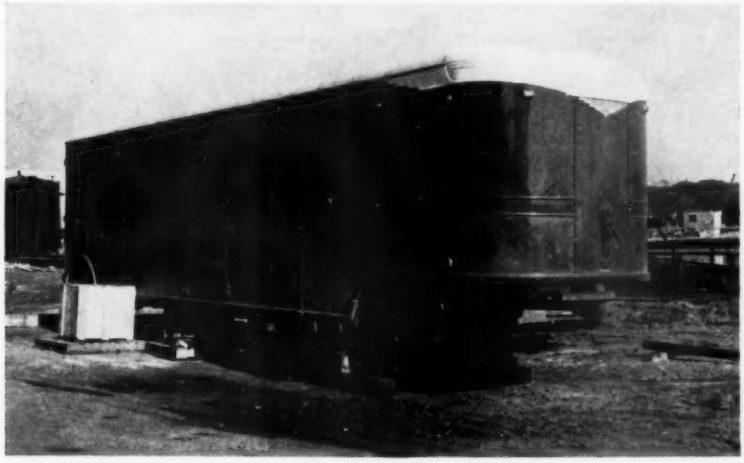


Fig. 5. Another piece of mobile equipment which is used for turnarounds is this 35 ft tool and storehouse unit. Several 1½ ton trucks are used in turnaround work



Catalog Aids Operations

We at Everett have a Refinery Materials Catalog system in which all items have a symbol number. Throughout the whole procedure the item symbol number permits the storehouse division's operations to be carried out with smoothness and dispatch. The symbol number positively identifies the materials. This, combined with a standardized specification which is carried by the item throughout the entire procedure, insures efficient operations. This catalog is in use in most of the Esso Refineries and wanted items can be teletyped to these refineries.

A human element is also involved in the operation. The decision on what long delivery insurance items to stock must be made by competent supervisors. Items may include pump casings, pump impeller assemblies, coils for motors, special valves. Many of these items may never be used; again, they may be used two days after they arrive at the plant. All the insurance items are generally high in cost.

Practically all crafts are employed at the Everett Refinery to handle mechanical work. Under the General Superintendent comes the Mechanical Superintendent who has an Assistant

(Continued on page 212)

Design Suggestion for Small-Plant Tin Plating Facility

Small plants have minimum demand and minimum space for tin plating . . . Author details basic equipment and its arrangement . . . Facilities are designed for non-production plating, will economically handle tools, small parts

By H. N. JOSLEYN

CONSTRUCTION of a tin plating facility will, in many plants, soon prove its worth and save many times the cost of its fabrication, in finishing small parts and tools. Readily available, a tinning layout will suggest new processes where this type of corrosion-protected surface is advantageous.

Necessary parts required for a tinning layout are four tanks, a tin pot, a raised rack and, if desired, an overhead conveyor system for handling the pieces during the plating. One of the tanks and the tin pot should be provided with a source of heat. A suggested floor plan is pictured.

Tank A is made of ⅛-in. or 3/16-in. plate, welded, and mounted on angle iron legs. This tank is used to hold a concentrated solution of caustic soda or other degreasing compound. Provision for heating the solution is made by installing a steam coil in the tank bottom.

Tanks B and C are of identical construction, of 2-in. planks supported on 4- by 4-in. wooden legs. Lining the tanks with ⅛-in. sheet lead or thoroughly sealing them with several layers of pitch will make them waterproof.

Fill tank B with commercial strength hydrochloric acid. If the "pickle" action proves too fast, it may be diluted with water.

Fill tank C with full strength hydrochloric acid, then add zinc until the addition causes no more boiling of the acid. This produces zinc chloride, an acid salt used as a flux for the plating.

Form the tin pot of ¼-in. plate, in a blunt wedge-shape. This shape has been found to provide more even distribution of heat over the bottom and sides. Gas or oil burners installed under the pot control heating.

Construct tank D of ⅛-in. plate, similar to tank A but not as large. Fill this tank with a light weight oil, such as SAE 10. Kerosene or palm oil, if used in the quench tank, will give the tinned material a bright, smooth, non-crystalline surface.

For the drain rack, use wood or angle iron. Sufficient area should be provided to drain and cool several pieces, as they come from the dip tank.

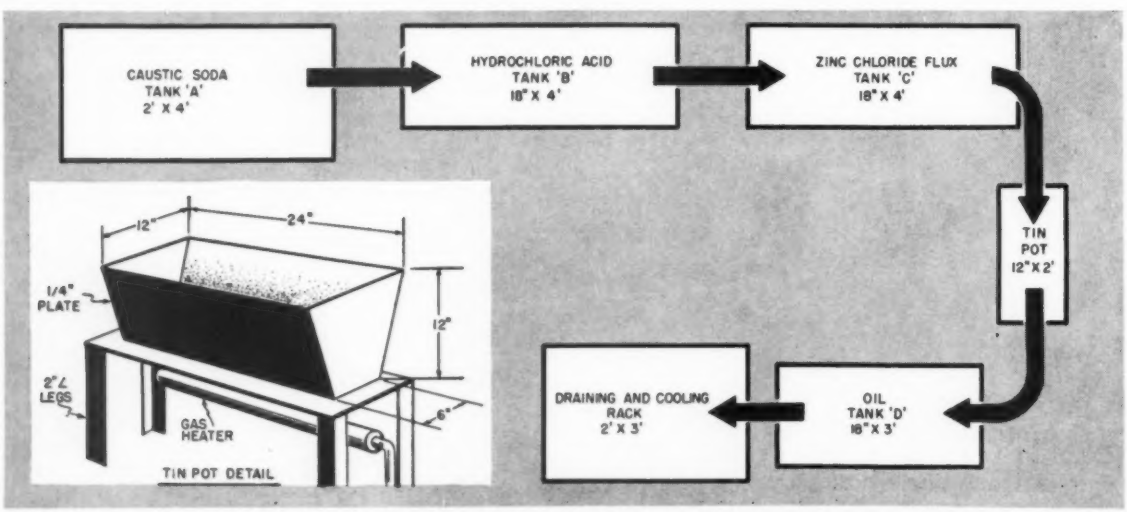
In plating, use pure tin, heated between 600 F and 700 F. At the correct temperature, the tin is white in color, and will melt a strip of pure lead (which melts at 621 F) when it is immersed in the tin.

To plate metal parts, first remove surface grease by dipping the pieces in the caustic tank from 5 to 10 minutes. The time should be varied depending upon the amount of grease present. The solution should be kept at full strength, and just under boiling temperature.

Next, dip the work in the hydrochloric acid tank (B), for one to five minutes, until the surface is clean. Length of this dip may vary with the concentrations of the solution. Following the acid bath, transfer the work to the zinc chloride flux for a few seconds.

Before dipping the workpiece in the molten tin, skim the liquid surface to remove dirty oxidized metal. Then wash the work slowly up and down in the tin bath until it reaches the bath temperature. Maximum heat transfer is important to insure firm and even distribution. If some spots do not take the tin readily, sprinkle a small amount of powdered sal ammoniac flux over the work. If spots still persist, the material should be re-cleaned.

After quenching the part in the oil bath for approximately 30 seconds, place the part on the rack for final draining and cooling.



Suggested floor plan of plating area highlights straight-line flow. Inset, tin pot detail shows simple lines of construction

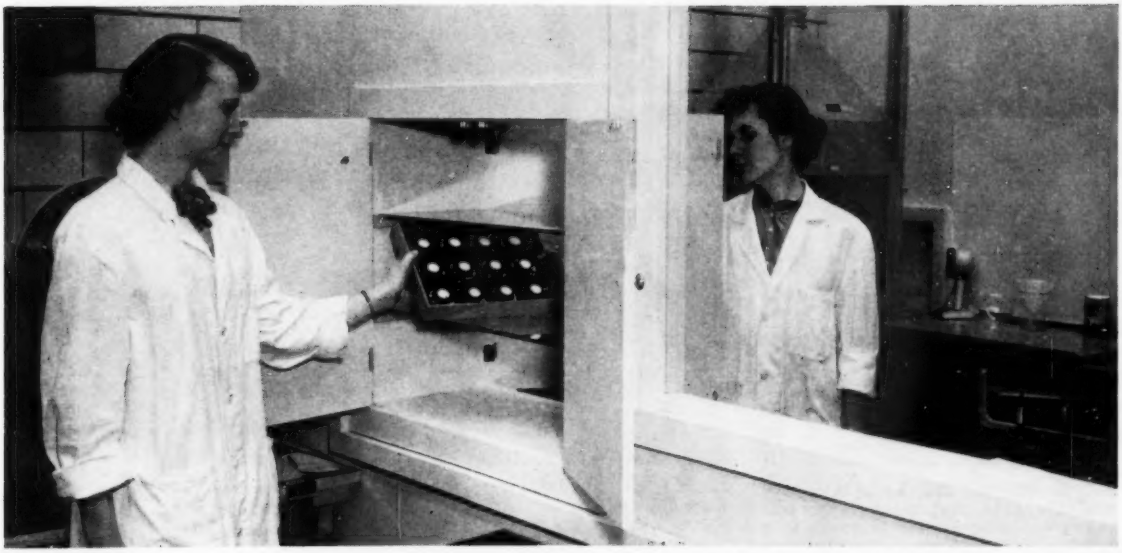


Fig. 1. These pass-through doors act as air locks to obviate the need for workers travelling between various rooms. It has been found that dust count rises appreciably when workers enter these conditioned areas from non-conditioned areas

Dust-Tight Rooms in Tube Plant

Air conditioning, electrostatic dust precipitators, special clothing, special construction, make the dust count in these tube assembly rooms notably low . . . Buffer corridors and pass-through air locks help keep dust count down, too

By J. LEMPERT, Electronic Tube Division, Westinghouse Electric Corp.

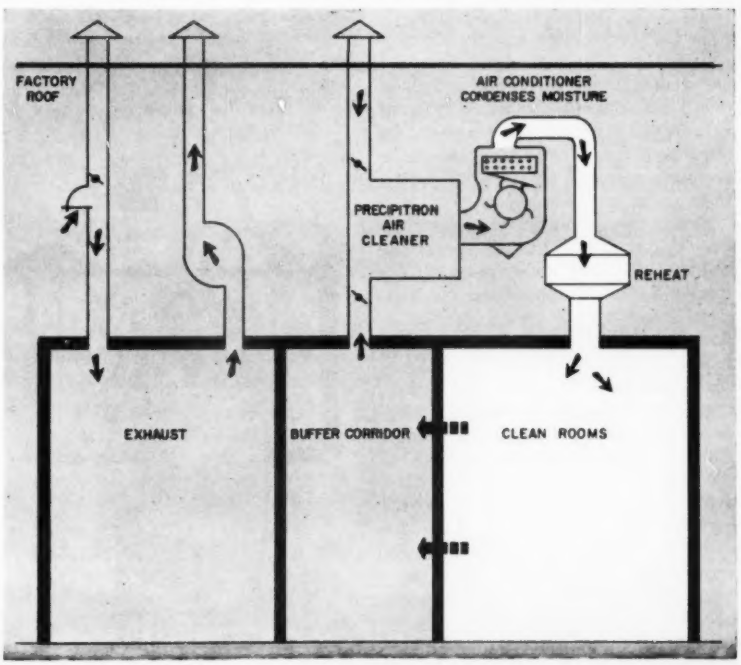
SPECIAL ROOMS for the manufacture of x-ray image intensifier tubes at the new Westinghouse Electronic Tube plant have been especially adapted to meet unusually severe production requirements.

There are a number of surfaces in the image intensifier tube. Any nonuniformity on these surfaces will result in a blemish which will be amplified by the tube and produce a spurious pattern in the final image. Presence of dust and foreign material too fine to be seen by eye may show up in the final picture.

Also, any slight amount of contamination will produce permanent and harmful poisoning of the two phosphor surfaces present in the tube. Furthermore, the need for high-voltage stability in a tube where the metal cesium, a very active material, is released as a gas during fabrication of the photosurface imposes further requirements for unusual standards of cleanliness. Finally, because of the use of phosphors, it is necessary to maintain close control of humidity.

A diagrammatic view of the facilities used to meet the above requirements is shown in Fig. 3. As can be

Fig. 2. Air is taken from the buffer corridors, combined with outside air and is cleaned by the Precipitron. Next it is cooled to condense the moisture, is reheated and pumped into the clean rooms at a pressure higher than the plant's



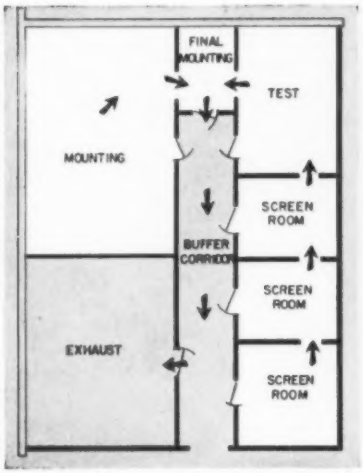


Fig. 3. This floor diagram of the image amplifier tube manufacturing area shows the general route taken by tube

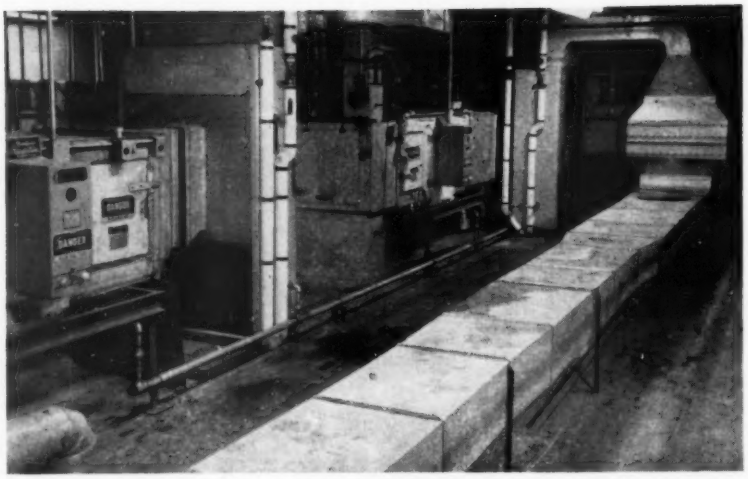


Fig. 4. The air conditioning equipment and the electrostatic precipitator equipment are mounted on the indoor roof of the image tube manufacturing area. A separate ventilating system is used for the "exhaust" room as shown in Fig. 2

observed from the diagram, the area consists of three rooms where the screens are fabricated. The electrode system of the tube, which is used for focussing the electron image, is assembled in the room designated as mounting room, and the tube finally assembled in the assembly room. When the lens stack of the tube is assembled it goes to the exhaust room for evacuation and processing of photosurfaces. After this, the tube is operated, inspected, and tested.

Temperature, Humidity Control

Two Westinghouse air conditioning units with 5-hp compressers are used to hold the humidity constant and maintain temperature at the desired level. Low humidity is obtained by reducing temperature with the air conditioner, and in this way condensing out a substantial percentage of moisture. The air is then reheated to bring it back to the desired temperature. In order to maintain very rigid standards of dust control, two Westinghouse Precipitron units were used.

Both the air-conditioning and the Precipitron units are mounted over the ceiling of the image tube rooms to save space. A photograph of the air handling installation is shown in Fig. 4. Air pressure in the rooms is maintained slightly above the level of the surrounding factory in order to insure that convection currents will not introduce dust when the doors are opened. As an additional precaution, each of the separate rooms described above has a positive pressure with respect to the corridor shown in Fig. 3. Thus the corridor essentially serves as a "buffer region" between the surrounding factory and the rooms in which critical operations are performed.

Figure 2 shows diagramatically how the installation operates. It will be noted that a separate ventilating system is used for the exhaust room. A lot of heat is generated in the exhaust process and extreme cleanliness is not required. Therefore, the primary object is to remove unnecessary heat.

It was found that the above precautions did not entirely insure that the rooms would be completely dust free, since motion of the operators themselves was found to be a source of dust. The dust-count in a room by the Precipitrons would rise from substantially zero to a definite value within minutes after an operator had entered the rooms, even though the operator wore an orlon smock and had a head covering. However, the above precautions plus the simple expedient of keeping the work covered as much as possible has produced satisfactory results.

In order to minimize motion of operators to and from rooms, a system of pass-through cabinets was devised, permitting passage of the work from room to room and allowing a convenient storage area for the work.

Walls of the rooms are fabricated of a glazed material which facilitates wiping dust off at regular intervals. All overhead ridges and utility pipes have been avoided in construction as much as possible in order to minimize dust. Thus, any dust in the room produced by motion of an operator will either be drawn out and trapped in the Precipitron system or settle on the floor and tables where it can be removed in routine cleaning.

"Buffer" Space

Where it is necessary to have a mechanical vacuum pump in the area, the pump is either mounted above the ceiling and the pumping line brought down, or the exhaust outlet of the pump is piped through the ceiling, out of the area.

The distribution systems for power and plumbing are piped into the rooms from the ceiling of the central "buffer corridor," as shown in Fig. 2. Switches for power into the rooms are incorporated in the bus duct.

Electric power, gas, and water lines enter rooms laterally through side walls. Thus, any leakage of air in wall partitions is from clean rooms to the "buffer corridor." Reverse drafts cannot bring in much dust since the air in the corridor is also air conditioned.

Experience has shown that in order to attain meticulous standards of cleanliness, it is necessary to combine carefully designed facilities with equally careful training of operators in good housekeeping habits, and to supplement both when necessary by scrupulous processing techniques.

For more facts circle 569 on Reply Card——→

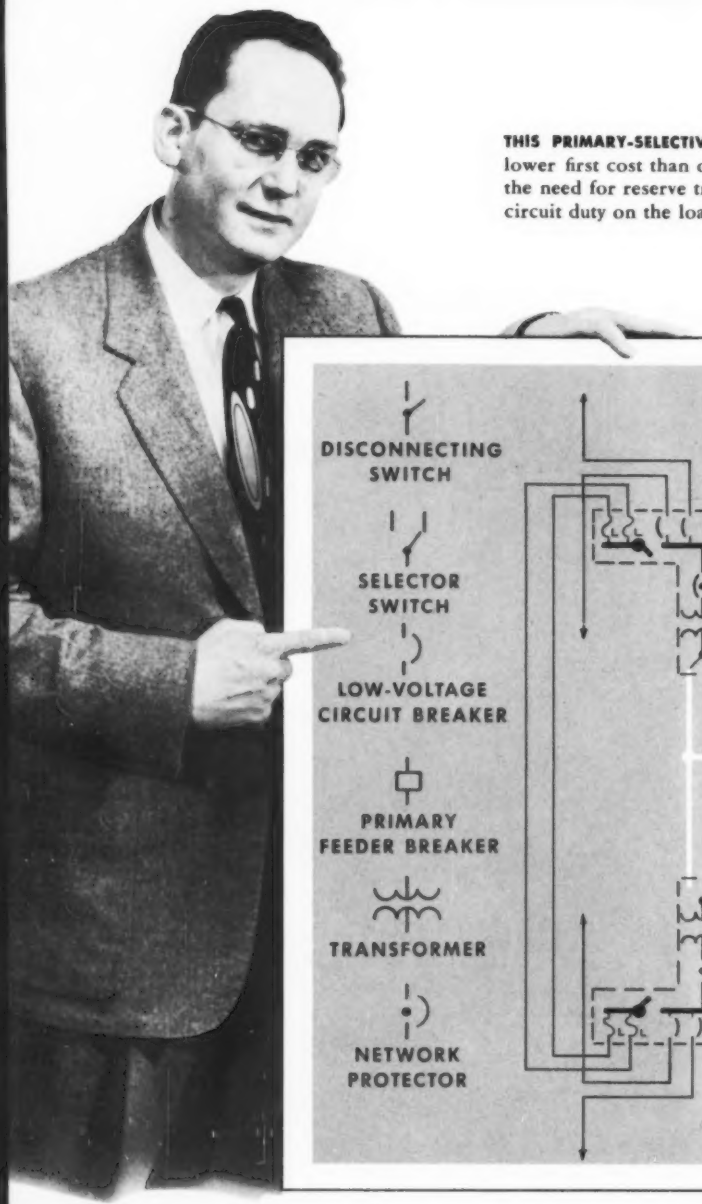
How to match your electrical system to production flexibility by:

1. Engineering power distribution
2. Standardizing high voltage control
3. Getting power to the load quickly

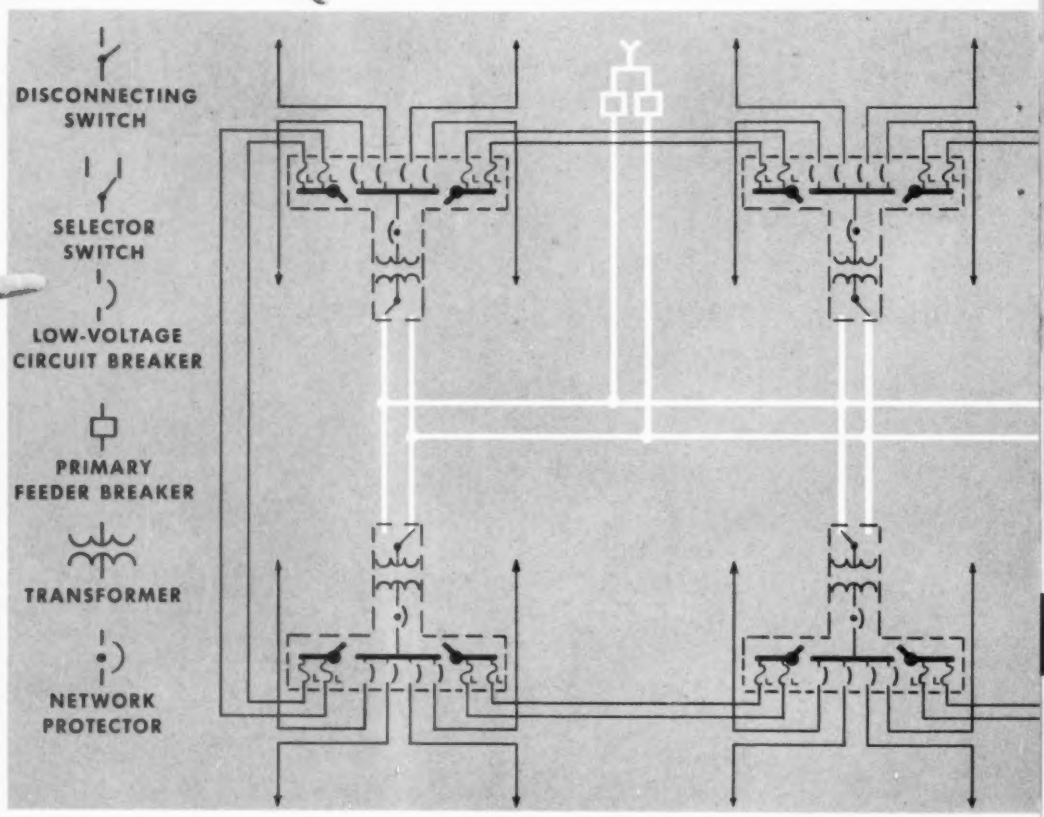
Meet Joe Harris, Westinghouse Industry Engineering Manager, who presents some ideas on improving electrical system flexibility.

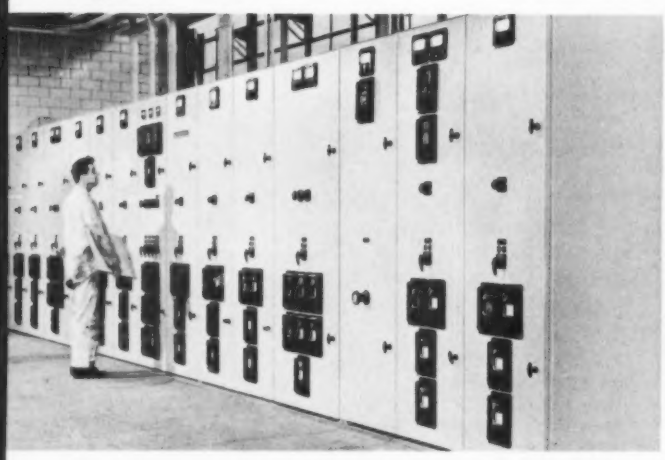
When you plan electrically for plant expansion or improvement, take advantage of Joe's wide experience in solving power distribution problems. It's part of the broad service your local Westinghouse representative offers in the talents of many design, engineering, and service specialists on the Westinghouse team.

Next page, flexibility starts with engineered distribution . . .

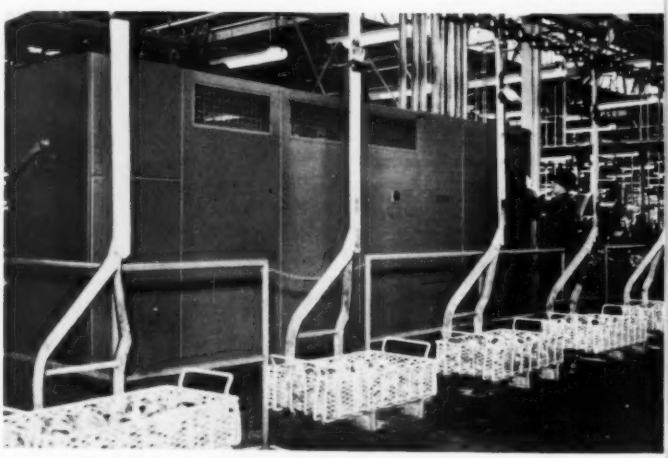


THIS PRIMARY-SELECTIVE NETWORK SYSTEM has the advantage of lower first cost than other types of networks because it reduces the need for reserve transformer capacity and reduces the short-circuit duty on the load circuit breakers.



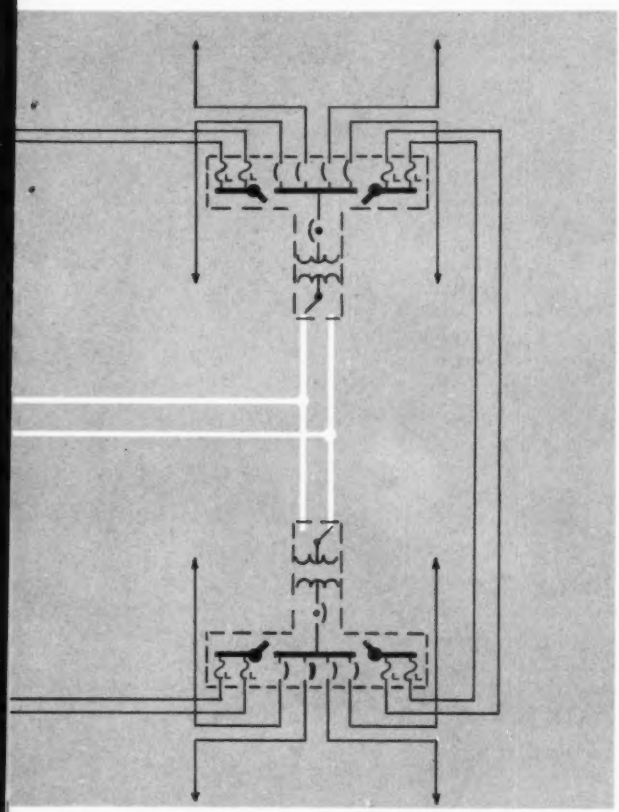


SWITCHGEAR IS EXPANDABLE in standard Westinghouse units. Standardized switchgear can be rearranged or relocated more easily to meet changes in future conditions. It also helps to speed maintenance and inspection.



HIGH VOLTAGE CLOSE TO THE LOAD is a cost-saving advantage you can achieve with Westinghouse power centers. They eliminate long, heavy secondary lines; save substantially on copper; lower line losses and improve voltage regulation.

Networks . . . one answer to flexibility, long-range planning

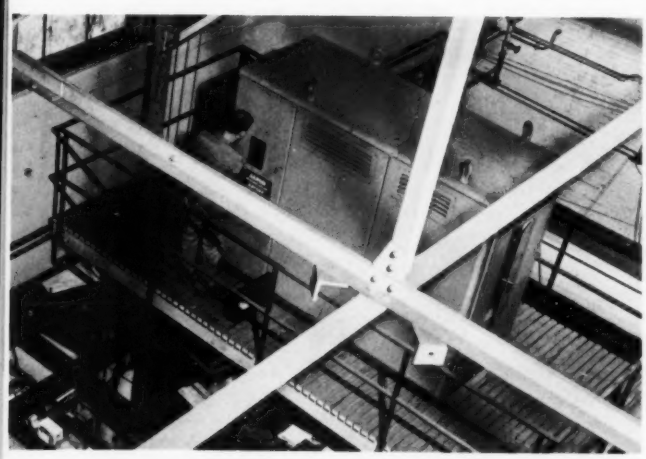


There are many excellent ways of distributing power in industrial plants. But if flexibility is your major requirement, you'll undoubtedly consider a network-type system. The slightly greater cost of a network system buys many immediate and long-term advantages. Network systems are easier to expand to handle increased power demands. Also this type of system is easily adapted to changing production needs which, in the long run, means economy.

Flexibility with this primary selective network system, for example, arises from the use of duplicate primary feeders—each capable of supplying the entire plant load. The feeder arrangement and the secondary-tie circuits permit the loads to divide among the power center, so that optimum voltage conditions are provided.

The ability to isolate any section of the system without disrupting service has obvious advantages. This permits maximum freedom in scheduling electrical maintenance or expansion, without disturbing operation of the plant. The network arrangement enables you to extend the system in any direction—at any time—with minimum rewiring and production loss.

Through the coordinating ability of your Westinghouse representative, you can take advantage of the wide experience that Westinghouse offers in engineering flexible power distribution. Coordinating equipment planning, manufacture, shipment, installation and servicing are all a part of the power distribution job handled by your Westinghouse representative. Call on him for help at any time.

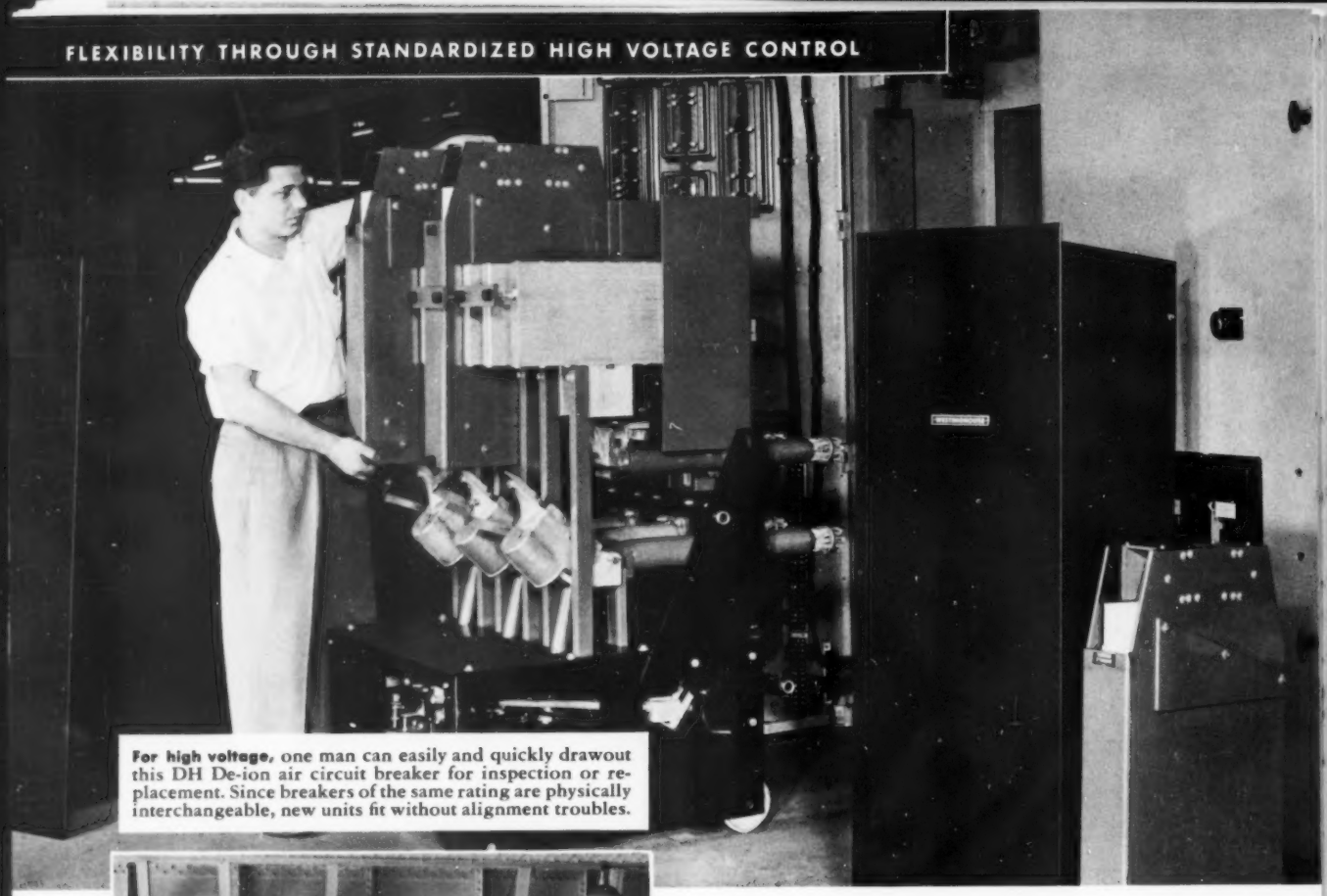


SPACE CONSERVATION is another advantage of Westinghouse dry-type power centers. You can install these compact lightweight Westinghouse units up out of the way of the working area—on balconies or roofs.

YOU CAN BE SURE . . . IF IT'S Westinghouse

Standardized switchgear adds flexibility this way . . . →

FLEXIBILITY THROUGH STANDARDIZED HIGH VOLTAGE CONTROL



For high voltage, one man can easily and quickly drawout this DH De-ion air circuit breaker for inspection or replacement. Since breakers of the same rating are physically interchangeable, new units fit without alignment troubles.

Convenient expansion or relocation with standardized metal-enclosed switchgear

To achieve truly flexible power distribution you need equipment that is as flexible as the system itself. Nowhere is this more vital than in switchgear equipment . . . the heart of your plant's electrical control.

Westinghouse switchgear achieves flexibility through standardized frame design and manufacturing techniques. Here's what this standardization means to you:

Easy expansion or relocation A minimum number of basic units, each performing an important function, meets all the requirements normally demanded of

More flexibility per dollar is possible with Westinghouse high voltage metal-clad switchgear because all your money goes into equipment. Special engineering is held to a minimum in standard components that can be assembled in any combination required.

YOU CAN BE SURE...IF IT'S

For low voltage DB De-ion breakers are unitized to allow easier expansion or rearrangement of secondary load circuits as plant requirements change. Drawout construction aids quick replacement and inspections.

switchgear. Expansion in plant facilities is met by simply adding the required switchgear units. Production changes affecting switchgear are accommodated by substitution and rearrangement of units. And since all electrical equipment and connections are completely self-contained, entire installations can be picked up and reinstalled in another location or in another plant.

High voltage versatility Jig assembly of the breaker and stationary structure of high voltage metal-clad switchgear allows rearrangement of breaker units within the same structure. And since breakers of the same rating are interchangeable, conversion to a higher interrupting capacity can be accomplished with minimum expense.

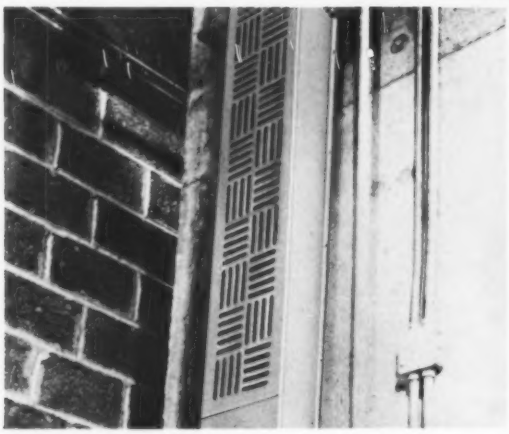
Low voltage service continuity Standardization means less production down time, too. Drawout, DB De-ion® breakers can be changed in three minutes flat. A spare breaker of the same rating can be substituted, and service continuity restored in short order.

Multi-purpose tripping provided only by Westinghouse low voltage DB De-ion air circuit breakers. Breakers allow delayed tripping on temporary overloads; trip on larger overloads before damage is done and trip instantly on short circuits.

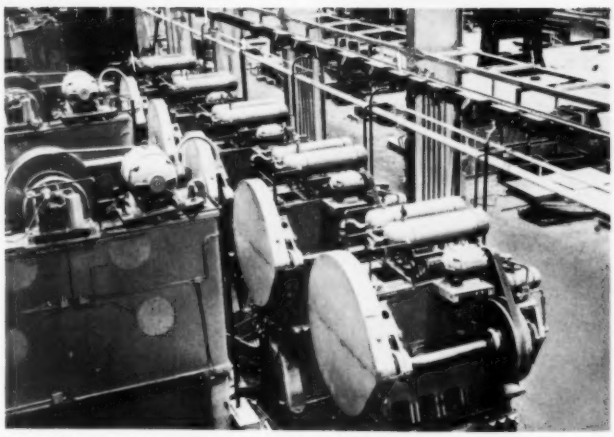
Next page, flexible equipment gets power to the load quickly . . . →

Westinghouse

From switchgear . . . Power is fed directly to the plug-in duct mounted in convenient location. With drop rods in position, duct goes up in a hurry, slide cantilever hangers to position and tighten.



To branch runs . . . This 2000 ampere, low-impedance riser carries power to the upper floors. Note the use of spring suspension hangers which compensate for expansion of duct . . . allow simple installation.



To machines . . . Six power take-offs in six feet of Westinghouse bus duct spell power flexibility for any plant. Plug-in receptacles are provided for circuit breakers, safety switches, and cover-operated fusible units.

Bus duct meets changing load requirements easily

Where system flexibility really pays off is in getting power from switchgear to your production equipment. For this reason alone, bus duct is one of the best investments you can make in secondary distribution.

Unequaled flexibility—Power can be taken off plug-in duct at one-foot intervals for maximum convenience. Plants can be retooled, buildings revamped without rewiring because bus duct can be readily relocated and installed easily, around obstructions, in any layout.

Costs less to install—Prefabricated in sections, bus duct goes in faster than cable and conduit. Savings in installation frequently reduce the original cost below that of any other secondary power distribution equipment.

Power for future loads—Bus duct spells future savings when building alterations and improvements add to power load. It provides important reserve capacity, and what's more, is readily salvageable, dismantled, reassembled, and expanded.

More power per dollar—Up to 5000 amperes, bus duct has greater current-carrying capacity, pound for pound, than any system of wireway or cable and conduit. There are four Westinghouse types: plug-in duct with service outlets for branch runs; low-impedance duct with low voltage drop for long feeder runs; weather-proof duct for outdoor installations that is available in feeder duct; and weatherproof duct in low-impedance duct.

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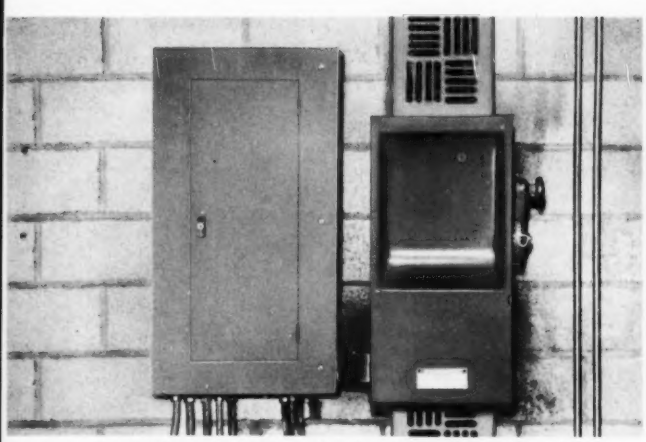

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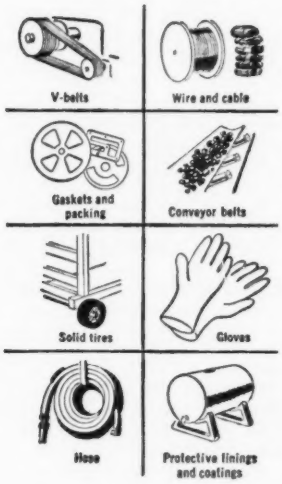

Wiring at the "wet end" of any paper mill is subjected to proving ground conditions—and the case of North Carolina's Ecusta Paper Corp. is typical. Here, hot steamy air and exposure to chlorine, caustic soda and other chemicals cut the service life of Type RW wiring jacketed with saturated cotton braid to five years.

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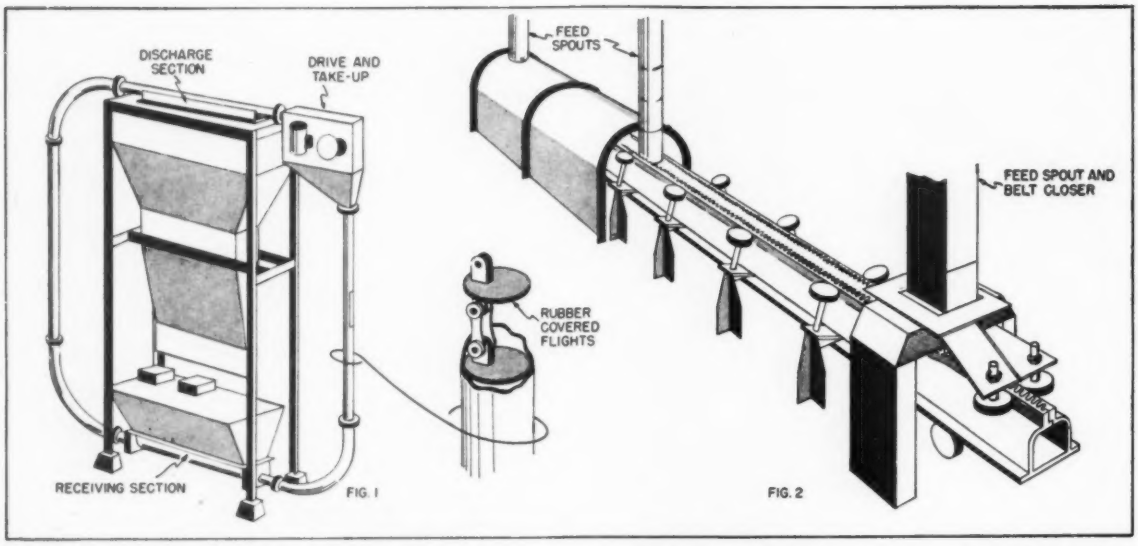

Figs. 1 and 2. The Hapman tubular conveyor, Fig. 1, permits flexibility since tube can travel vertically, around corners and horizontally. The Zipper conveyor, Fig. 2, handles bulk food, coal, granular, flaky materials and small lumps

Conveyors Do the Darndest Things

Many of industry's materials handling problems can be solved with the use of standard belt or roller conveyors . . . The unusual materials handling problems can be handled by the unique conveyors mentioned in article

By SIDNEY V. WORTH, Mechanical Engineer

IN MOST CASES, a standard belt or roller conveyor will answer industrial needs in some particular materials handling problem. However, just as soon as some unusual problem presents itself, one almost immediately thinks of a "special" conveyor or machine as a solution—a device that would probably be quite costly in initial cost, one that may entail a great deal of expense until it is operating smoothly and one that will require a certain length of time until it is designed and fabricated. Even after it is running smoothly, it will not be as good as a similar device which has had its "kinks" ironed out again and again after each successive fabrication and installation.

Fortunately, today, we have numerous unusual but standard conveyors and devices which will solve most materials handling problems. Much of this equipment is sufficiently flexible to be put to numerous uses beside the particular one in mind. Furthermore, proper study and understanding of the equipment will often indicate that a slight modification is all that may be needed to make it fit a particular set-up. It is a good idea then, to consult with the manufacturer if it is thought that there is even a remote chance that his equipment, when modified, may solve the materials handling problem on hand. Such action can often save quite a bit of time and money.

The following equipment is an example of what one has to draw upon today. In most cases, the items described can be purchased right out of stock or they can be gotten on very short notice. In many cases too, modifications requested are handled as part of the general order without any loss of time in fabrication.

Handling Bulk Materials

Figure 1 shows the Hapman tubular conveyor which consists of circular disk flights attached to a chain which is pulled through a steel tube —the conveyor proper. This design permits extreme flexibility since the tube can be fabricated to travel vertically, around corners, at any slope and horizontally.

Flights of this conveyor can be made of a large variety of materials so that they can handle abrasives, powders, hot materials and such, easily, with a minimum of breakage and with general cleanliness. Since the conveyor is self cleaning, it is even possible to handle two or three different products without any contamination.

In essence, Stephens-Adamson's Zipper conveyor, Fig. 2, is a moving rubber tube which is closed along its entire length by means of locking teeth. Unlocking these teeth anywhere along the belt path gives openings for charging the conveyor or for discharging material.

When completely closed, the conveyor can readily handle bulk food, coal, granular, flaky materials, small lumps, at speeds up to 200 fpm and over long distances. The belt can be twisted 90 deg, 180 deg or more in its course, as desired, and it can be made to by-pass almost any obstruction quite readily.

Crescent flat top chains are ideal conveyors for such items as bottles, cans or hot glassware. The chain, Fig. 3, comes in two types: In one, it can swivel in a horizontal plane only, while in the other it can swivel in both a horizontal and vertical plane around its universal pins. Both will allow a slight slope.

This conveyor can be built in almost any length. It needs only one drive, requires no lubrication of the chain and it is practically breakdown proof requiring a minimum of conveyor maintenance.

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Where one is hemmed in for space and one still needs a great length of conveyor the Multi-Tier of J. W. Greer Co., Fig. 4, is the solution. One example of the possibilities with this equipment is a floor model which takes 120 sq ft of floor space but which gives 35 minutes of tray traveling time. By building the conveyor further up to the ceiling with more tiers, this time can be increased to 10 hours.

Trays are attached to a smoothly traveling roller chain so that their contents are not jarred the slightest bit. Also, at all times, the trays are kept absolutely horizontal so that liquids too can be handled readily.

Unusual Features of Conveyors

In a proper track and on a suitable frame, a link type cast duoflex chain, Fig. 5, serves extremely well as a carton and can conveyor. It can easily be bent in a radius as small as 18 in. for tight quarters.

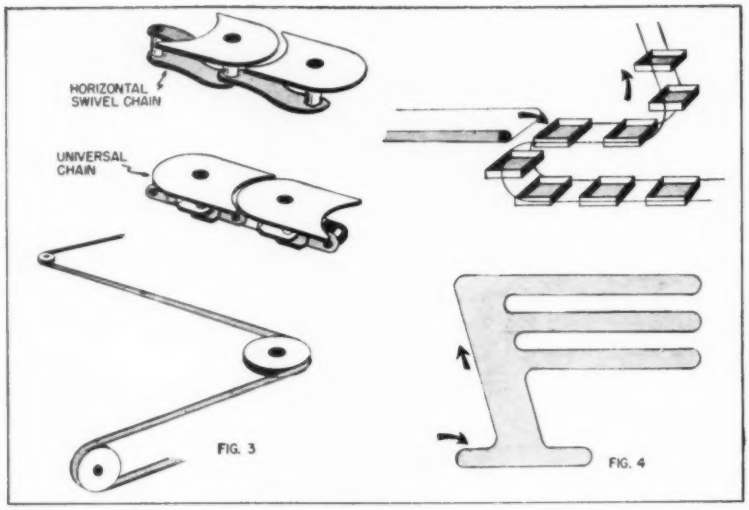
Made by Maguire Machinery Co., a duo-flexible chain permits hot materials to be handled without damage to itself. It also finds good use where sanitary conditions must be maintained and where liquid drainage takes place.

The cast or stamped roller chain of E. W. Buschman Co., riding in a suitable trough, Fig. 6, makes a rugged, inexpensive conveyor. An outdoor application is just perfect for it since it requires practically no maintenance year after year.

Small, light, belt conveyors can be obtained in many varied forms.

Standard Conveyor's Handipiler, Fig. 7, is such a small conveyor which is mounted on locking casters, making it portable. It can be obtained in 14 in. and 24 in. widths and with a 7½ to a 12 hp, reversible motor.

An interesting feature of this equipment is that its boom is adjustable in its angle of slope so that it can be used especially well in stacking operations.



Figs. 3 and 4. Crescent flat top chains, Fig. 3, are suitable for bottles, cans or hot glassware. Answer to your space problem may be the Multi-Tier conveyor, Fig. 4

Standard's Extend-O-Veyor, Fig. 8, is a portable belt conveyor whose over-all length can be readily and rapidly varied. For example, one model extends from 7 ft 1 in. to 21 ft 6 in.; another 7 ft 4 in. to 28 ft 0 in. It is obtainable in 14 in. and 24 in. belt widths driven at 75 fpm by a ½ or ¾ hp motor. There are also standard units available which extend left and right of the center drive unit.

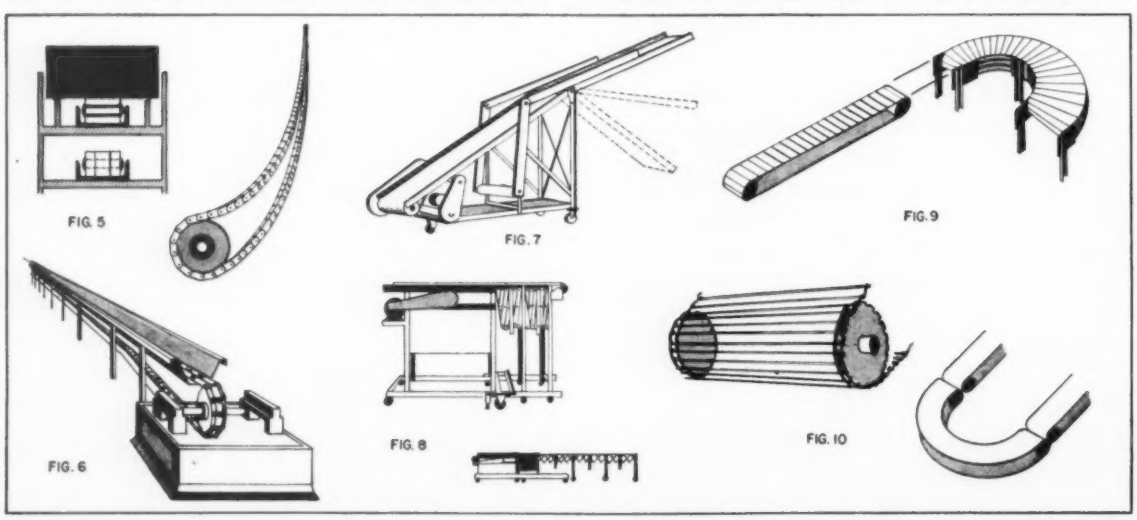
The crying need for equipment to carry material smoothly and easily around bends has been met by many manufacturers. Conveyor in Fig. 9 has slats attached to two flexible chains which travel in properly curved channels. Ordinarily 14 gage metal slats are used—any metal desired being provided—with special flights attached as needed. The conveyor is made in 12 to 36 in. widths and up to 175 ft long in a straight length. Speeds are variable from ½ to 60 fpm.

Variations in the general conveyor design are readily obtainable. For example, the return belt can be made to travel at a sufficient distance below the top belt so that it can be used to handle material flowing in the opposite direction.

The grid wire belt conveyor, Fig. 10 is another conveyor which can be used on turns. It consists of thin wires hooked together at their ends, propelled by special sprockets and guided along a suitable slide bed and restraining angles. It can be obtained in widths of 6 to 24 in. and in straight lengths up to 40 ft. It should be used for very light loads and slow speeds.

Because of the belt's open con-

Figs. 5, 6, 7, 8, 9 and 10. Conveyors illustrated below are: Duo-flex chain, Fig. 5; roller chain, Fig. 6; Handipiler, Fig. 7; Extend-O-Veyor, Fig. 8; conveyor with slats attached to two flexible chains, Fig. 9; and grid wire belt conveyor, Fig. 10



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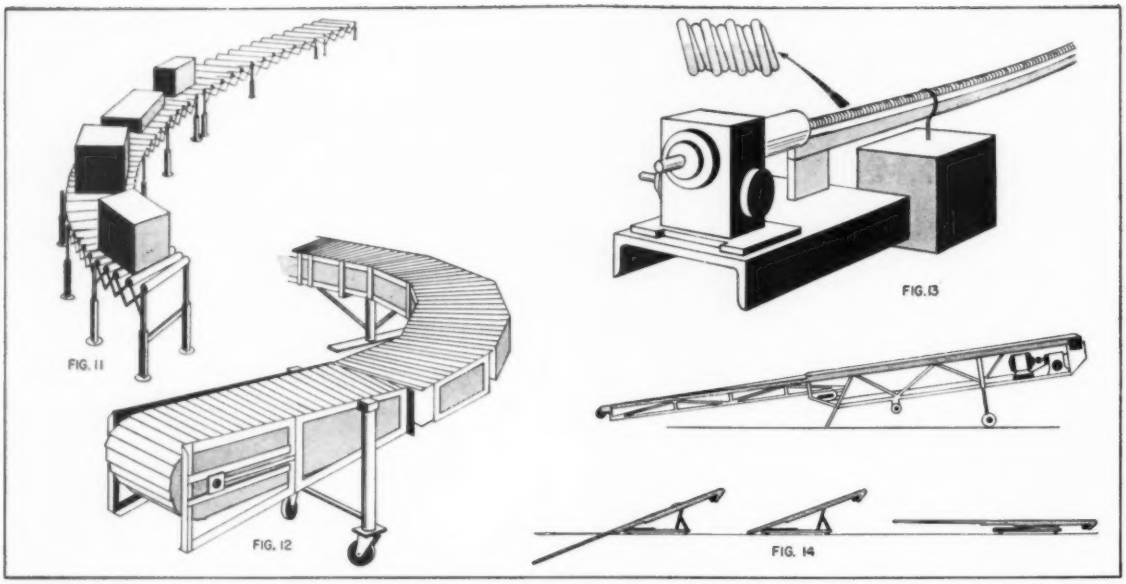


Figs. 11, 12, 13 and 14. Other unusual standard conveyors are: Accordion gravity conveyor, Fig. 11; conveyor with slats fixed to a movable chain, Fig. 12; overhead cable conveyor, Fig. 13; and the portable Adjustoveyor, Fig. 14

struction, it finds excellent application where drainage must take place or when powder must be sprinkled on the material it is handling—or where heat must be applied. Because sprockets as small as 2 in. in diameter work satisfactorily on this conveyor, it also finds use where deck or stack belts are required or where head room is at a premium.

Extensible roller conveyors can also be found similar to the Accordion gravity conveyor, Fig. 11. This particular type conveyor consists of 3-ft long sections which extend to 10 ft and which can be raised from 20 to 30 in. by adjusting the telescoping legs. It is obtainable in 14 or 18 in. split roller widths for minimum carton sliding on curves. (The conveyor is flexible too so that it can be readily curved as desired.) By merely collapsing any section, turning it over and balancing it on the end roller, it can be transported to any desired location with a minimum of effort.

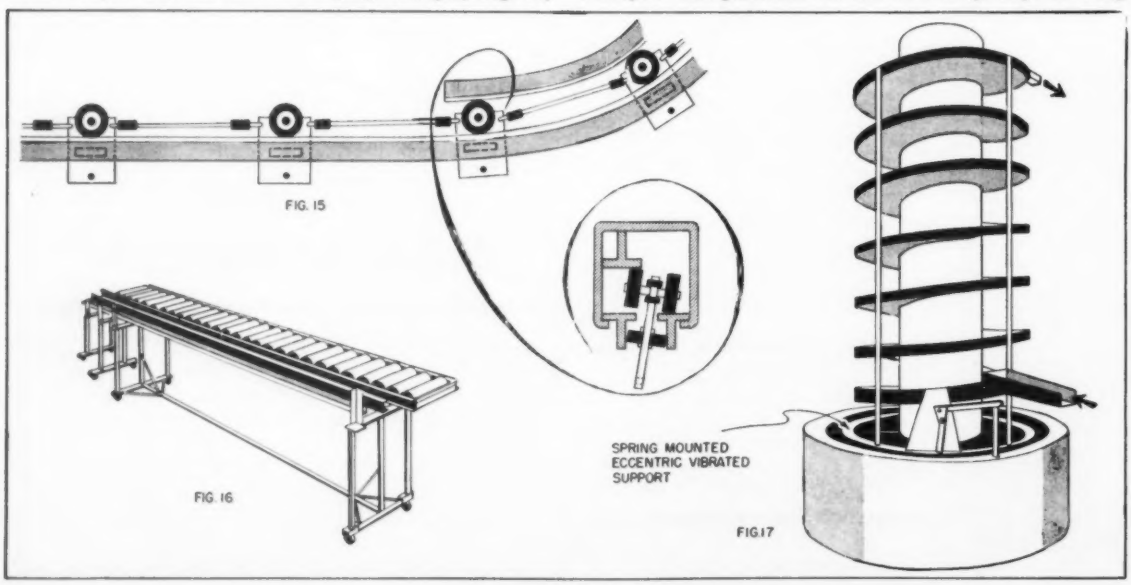
Because of its extreme flexibility, the additional cost of the accordion conveyor, Fig. 11, over the regular conveyors is usually well warranted. It usually pays for itself quickly in man-hours saved in different material handling set-ups and in more rapid and more direct handling.

Slats fixed to a movable chain running in a suitable track is the heart of Flexible Conveyor Company's JCD conveyor, Fig. 12. The conveyor bed is made up of two foot joined sections which can swivel 22½ deg so that in a floor space of 6 ft, a complete 90 deg turn can be made with a few sections.

The slats are aluminum, 20 in. wide, driven by a 3 hp reversible variable speed motor up to 45 fpm. The standard model is 30 ft long—adjustable in height, if desired, by hydraulic lifts. It weighs 2100 lb. Casters on its legs allow it to be moved around and relocated as desired without undue trouble.

Figure 13 shows a very inexpen-

Figs. 15, 16 and 17. Sharp turns are possible with the Econ-O-Veyor, Fig. 15. The telescoping conveyor, Fig. 16, can extend from 10 to 30 ft. Figure 17 illustrates the spiral conveyor. This particular one has an average slope of 9 deg



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sive, versatile, light duty material handling item, the overhead cable conveyor. The cable of this conveyor is very flexible, encased in a U-shaped housing which can rise and fall or bend around obstructions as required. As the cable is turned at one end by a ½ or ¾ hp motor, hooks resting on it are caused to advance along the cable helix at a forward speed of 12 fpm.

With a little bit of thought as to the conveyor hooks required, quite a large number of items can be handled as long as they do not exceed the maximum allowable load of 15 pounds per foot. Since it is also true that a bending radius of as little as 4 ft is allowed and since straight lengths of 200 ft or so are not excessive, this conveyor can be adapted beautifully to many unusual cases.

A complete combination of conveyor versatility is found in Stewart-Glapat Corporation's Adjustoveyor, Fig. 14. It is mounted on casters so that it is portable; its slope can be easily and quickly changed; and its length can be varied. As an example, one model extends from 10 ft to 17 ft 6 in. and stacks to a height of 10 ft at a maximum belt slope of 30 deg. This model can carry a weight of 850 lb on its 14 in. belt and it is equipped with either a ½ or ¾ hp motor.

Such equipment is purposely built "light" so that it has the utmost of portability built into it enabling the conveyor to be changed over rapidly to many jobs in many locations.

Recently, light duty monorail type installations have become popular in industrial plants. A good example is the Econ-O-Veyor of Shuler Conveyors, Inc., which consists of trolleys made of standard roller bearings rolling on steel T sections, see Fig. 15. The trolleys are linked to each other by thin rods. In turns, additional T's are used to restrain the trolley so that best load distribution is obtained and so that the trolley hooks remain nearly vertical.

Each Econ-O-Veyor trolley is designed for a maximum load of 45 lb at the forward speed of 3 to 21 fpm. Rather sharp vertical and horizontal turns are possible—a complete 180 deg being made in as little as 4 ft of floor space.

Other Unusual Conveyors

The value and versatility of a gravity roller conveyor can hardly be underestimated. However, to further enhance its utility, it is sometimes built to extend or decrease its length as desired or required as materials are loaded or unloaded—a worthwhile, time saving feature.

As an example, the telescopic conveyor illustrated in Fig. 16, can extend from 10 to 30 ft. When fully extended, the various sections can be made flush level and locked. The conveyor is obtainable with either skate wheels or rollers. It is portable and easily adjustable in height.

Flat natural frequency conveyors are not too uncommon but spiral conveyors built on the same actuating principles are. In essence, the spiral conveyor pan is mounted on springs and vibrated by a motor driven eccentric. Since a natural vibration frequency is set up, only a very small motor is needed.

The conveyor, Fig. 17, is typical, having an average slope of 9 deg. It has a 12 in. pan and an 18 in. center tube. Material travels upward, smoothly and rapidly at speeds up to 60 fpm.

Sacks, bales of paper, cotton bundles and shingles can often be handled best by special conveyors. The Twin-veyor, Fig. 18, is an excellent example. This conveyor consists of sections which contain two tubular external screws that turn toward each other, propelling material lying on them forward at speeds of 90 fpm. Each section is 8 ft long joined to its adjacent section through a quick connecting universal joint. The joints allow deflections up to 15 deg so that material can be made to flow up, down or in a curve, as desired.

The standard Twin-Veyor of Mechanical Handling Systems, Inc., consists of 6 units plus a power head giving a length of 50 ft. However, additional sections can be added to increase this figure to 100 or 125 ft. A 5 hp motor is standard in the power head. The entire conveyor can be quickly dismantled, loaded on a special dolly and transported by one man as required.

Moving V belt sections, linked together, make an excellent conveyor not only for bales and sacks but also for cartons of various sizes and shapes. Such a conveyor is the Rope-Veyor of Mechanical Handling Systems, Inc., Fig. 19, which consists of 8-ft V belt units linked together by flexible universal joints to give overall lengths up to several hundred feet. Each section can be deflected up to 15 deg, vertically and horizontally, so that a great deal of flexibility is possible.

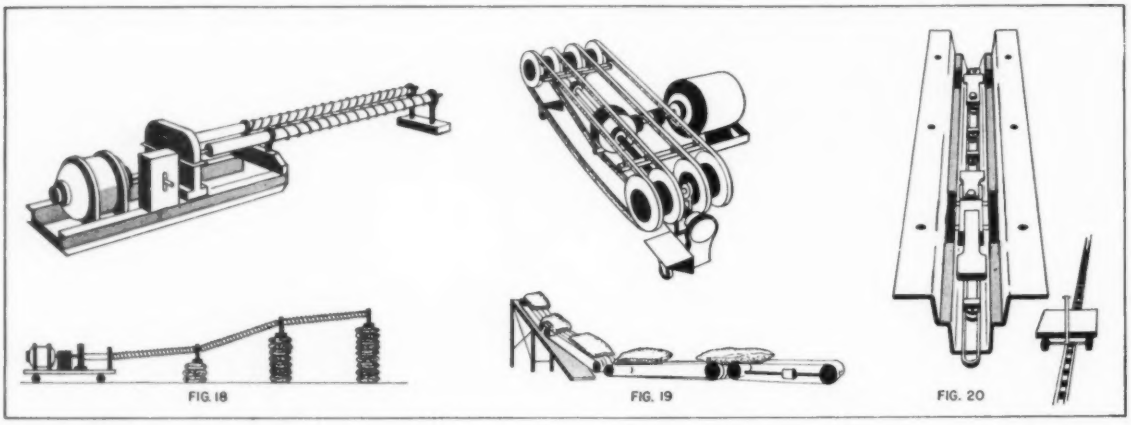

FIG. 18 FIG. 19 FIG. 20

Figs. 18, 19 and 20. The Twin-Veyor, Fig. 18, will handle sacks, bales of paper, cotton bundles, etc. Cartons of various sizes, in addition to sacks and bales, are handled by the Rope-Veyor, Fig. 19. Figure 20 shows roller chain conveyor

The power head unit contains a standard 5 hp motor which drives all the units at 96 fpm. This is more than adequate power to propel the design load of 500 lb per unit.

As a method for eliminating all overhead structural work, roller chain conveyors, Fig. 20, have been sunk into the floor with their tracks, and equipped with connecting toe-pin catches. Overhead dollies drop their pins into these catches and are conveyed along the predetermined track path. Engagement or disengagement can be made anywhere along the chain. If a dolly meets an obstruction, it is automatically released by a built-in safety dog. Foreign matter dropping through the narrow opening into the chain track is carried along by chain wipers to a well where it is removed.

If desired, this type of conveyor can be hung from supports so that dollies are engaged about 7 or 8 ft above the floor. However, the sunken conveyor is most desirable because of the clean layout it offers.

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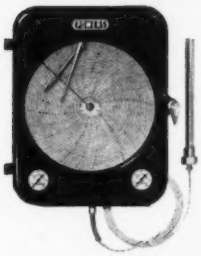

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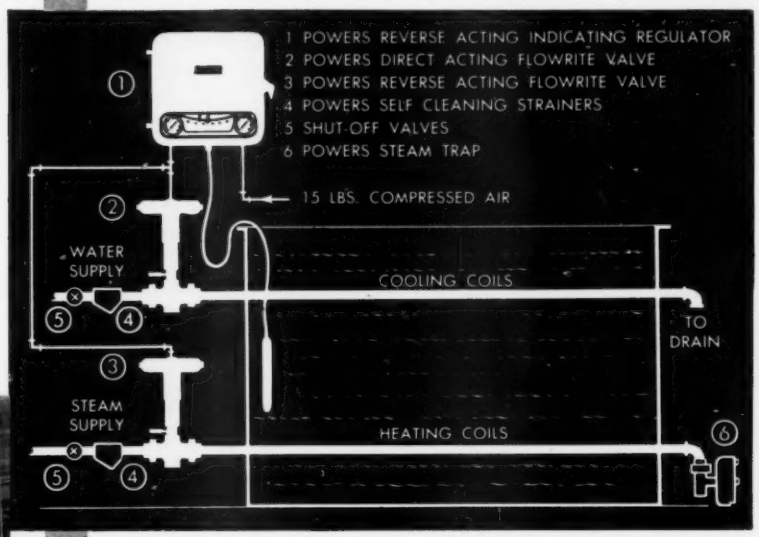

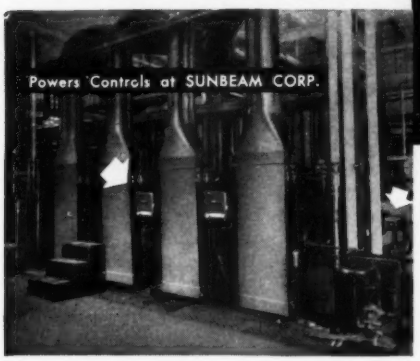

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OVER 60 YEARS OF AUTOMATIC TEMPERATURE CONTROL

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Officers and guests at head table, standing, l. to r., are: R. H. Ward, Eastern Refractories Co.; A. G. Smith, Monsanto Chemical Co.; M. Davis, Chairman of the Outing Committee, Sylvania Electric Products, Inc.; W. S. Baldus and A. R. Hoar, United Shoe Machinery; Rocky Marinello, Plant Engineering magazine; and E. W. Benner, American Sugar Refinery Co. Seated, left to right, are: J. J. C. Coffin, Jr., Towle Mfg. Co.; J. Sweet, Harvard Brewing Co.; L. C. Schoenherr, New England Confectionery Co.; D. J. Shea, Simplex Wire & Cable; L. J. Monty, Artisan Metal Products

Boston Plant Engineers' Club Celebrates 39th Anniversary

MEMBERS AND GUESTS of the Boston Plant Engineers' Club attended the annual outing, held at United Shoe Machinery's Country Club, to celebrate the close of another successful year of Club activities.

The previous year's activities began with the October meeting which consisted of a visit to the Esso Standard Oil Co. refinery at Everett, Massachusetts. Mr. Nils Bengston, mechanical superintendent, gave an interesting talk on refinery operations. This meeting was attended by 43 members, 26 guests.

Mr. Robert Lowrie was assisted by Mr. Richard Clark, of New England Telephone and Telegraph Co. in presenting the talk at the November meeting on "Television Skyways." This meeting was attended by 33 members and 19 guests.

At the December meeting, Mr. E. H. Barry, of Stone & Webster Engineering Corp. discussed "Trends in the Design of Industrial Steam Plants." Meeting was attended by 35 members, 23 guests.

Mr. G. Miner, of Ernst & Ernst, told the group about "Techniques of Plant Maintenance" at the January meeting. Meeting was attended by 39 members, 35 guests.

Members and guests visited the Bird & Son Paper Mill, East Walpole, Mass., for their February meeting and listened to Mr. R. C. Holman of Bird & Son tell about "Maintenance Problems of a Paper Mill." Meeting was attended by 35 members, 40 guests.

At the March meeting, Mr. R. E. Hawes, of Pittsburgh Plate Glass Co., gave an interesting talk on "Color Dynamics." Meeting was attended by 36 members, 32 guests.

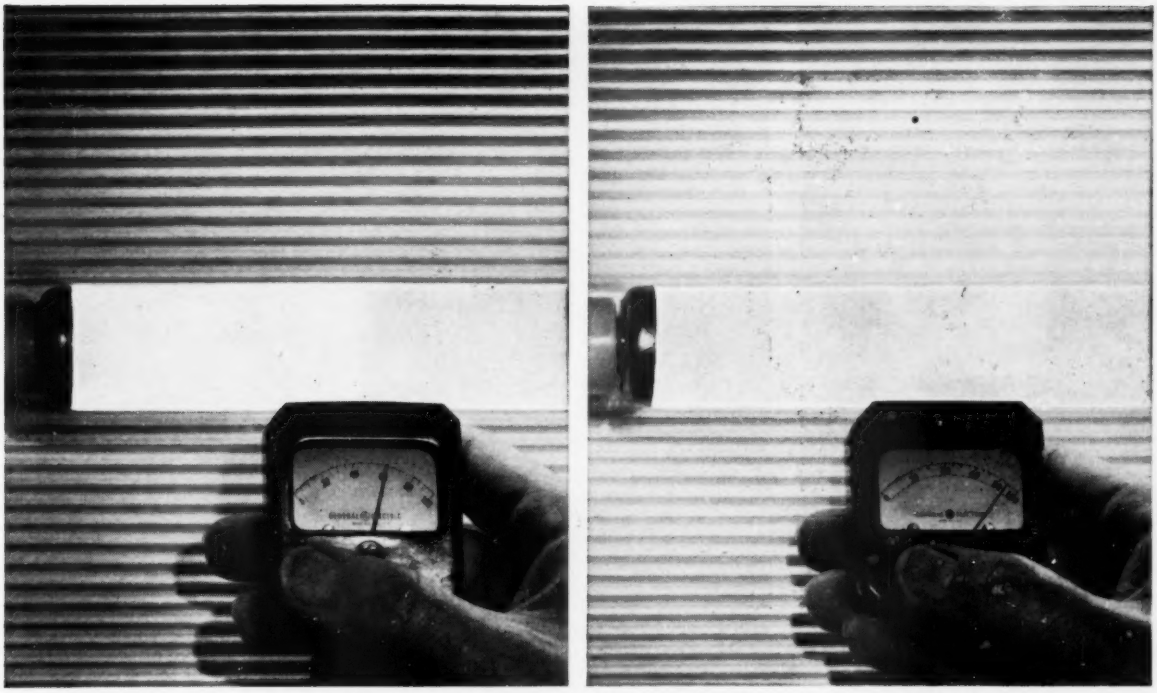
For the April meeting, the Club visited the plant of U. S. Steel Corp., Steel and Wire Division, Worcester, Mass., in addition to hearing Mr. M. W. Clemment, superintendent of engineering and maintenance, tell about "Maintenance Problems," and view a color film "Making Steel from Raw Material to Finished Product." Meeting was attended by 38 members, 31 guests.

Mr. D. C. Bratton, of Armstrong Cork Co., discussed "Modern Trends in Industrial Insulation," at the May meeting. Officers for the coming year were also elected at this meeting. James Sweet, Harvard Brewing Co., is the new president; Daniel J. Shea, Simplex Wire & Cable Co., was elected vice president; Louis Schoenherr, New England Confectionery Co., was re-elected secretary; and Leo J. Monty, Artisan Metal Products, was re-elected treasurer. Meeting was attended by 42 members, 21 guests.

It is interesting to note that the

(Continued on page 212)

Although only two of the four banquet tables are shown here, this view will give you some idea of the number of members and guests who attended the outing



Regular slimline, left, gives 620 units of light. New High Output Rapid Start lamp, right, gives 840 units of light.

NEW GENERAL ELECTRIC FLUORESCENT LAMP GIVES ⅓ MORE LIGHT THAN ANY PREVIOUS FLUORESCENT

LIGHTS ALMOST INSTANTLY—General Electric announces the most important advance in fluorescent lighting in 10 years: the new High Output Rapid Start fluorescent lamp. The 96-inch High Output lamp gives 36% more light than the most powerful G-E fluorescent lamp previously available.

For new installations, General Electric High Output lamps offer this ⅓ bonus of light without increasing the number of fixtures or maintenance costs.

This big increase in light, with no increase in lamp size, has been achieved through a special cathode developed by General Electric which permits a boost in lamp wattage to 100. Because the cathode is of the famous General Electric triple coil design, these Rapid Start lamps light up almost instantly. General Electric High Output lamps have a rated life of 7,500 hours, the same as all General Electric general lighting fluorescent lamps.

A new G-E base and socket design protects the lamp contacts by recessing them. A simple push-pull sets the lamp in its fixtures.

HAS VARIETY OF USES

The new General Electric High Output fluorescent lamp is especially suited for use in areas with high ceilings, in factories, warehouses, offices and stores. Also in store windows, showcases and other places where you want higher lighting levels in keeping with the modern trend. New fixtures designed for the G-E High Output lamp will soon be available from a number of lighting fixture manufacturers.

For information, write to Lamp Division, General Electric Company, Dept. 166-PE-9, Nela Park, Cleveland 12, Ohio.

Progress Is Our Most Important Product

GENERAL ELECTRIC

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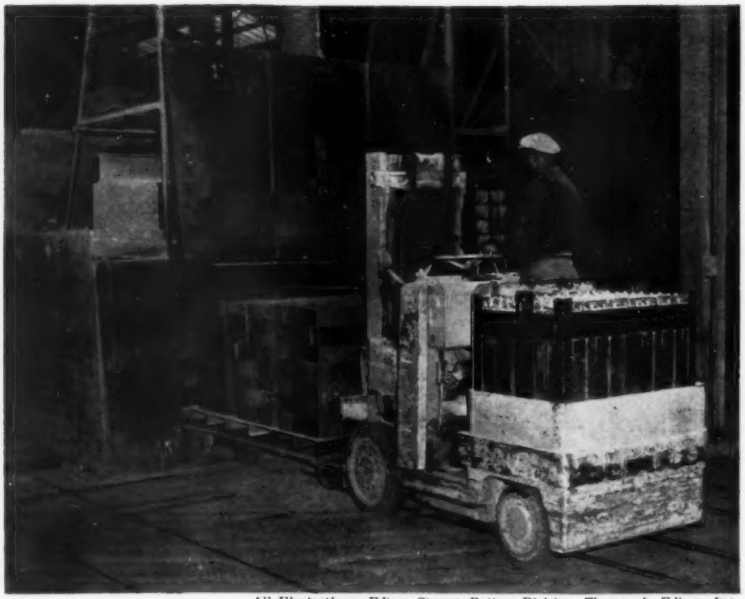
Fig. 1. One of the many duties of industrial trucks is tiering fired brick



All Illustrations: Edison Storage Battery Division, Thomas A. Edison, Inc.

Fig. 2. Pallets of brick are set down on dryer cars which are pushed into oven by industrial truck. This action forces load of cured bricks out discharge end

Industrial Trucks Keep Production "On the Move" at Harbison-Walker

Unit-loading at Harbison-Walker's Baltimore plant permits maximum use of industrial trucks . . . Battery shop at plant is well equipped to see that the industrial trucks are always in top shape to handle heavy work load

By T. W. LLOYD, District Supt., Harbison-Walker Refractories Co.

WHEN OUR COMPANY opened its new Baltimore plant in 1947, nine electric industrial trucks were adequate to perform virtually all intra-plant material-handling operations.

During the seven years that our plant has been producing, the number of electric material-handling trucks has doubled. Increased production and greater use of the trucks has accounted for the need of some of this additional handling equipment, but, significantly, one of the major reasons for expanding the truck fleet has been the increased demand of consumers to have refractory brick shipped in unit pallet loads.

In addition to providing the sole means of handling brick from finished storage to shipping, the trucking system has also been applied to the unit-load handling of material at receiving, in storage and in process.

Wherever possible, pallet-to-pallet handling is employed. At the operation in which the steel blanks are formed, for example, the operator picks up blanks from one pallet, forms them, accumulates the formed pieces on another pallet ready to be carried by fork truck to interim storage. Immediately adjacent to his forming machine is a skid hopper in which rejects and imperfect blanks are accumulated; these loads are also handled by the plant's trucks.

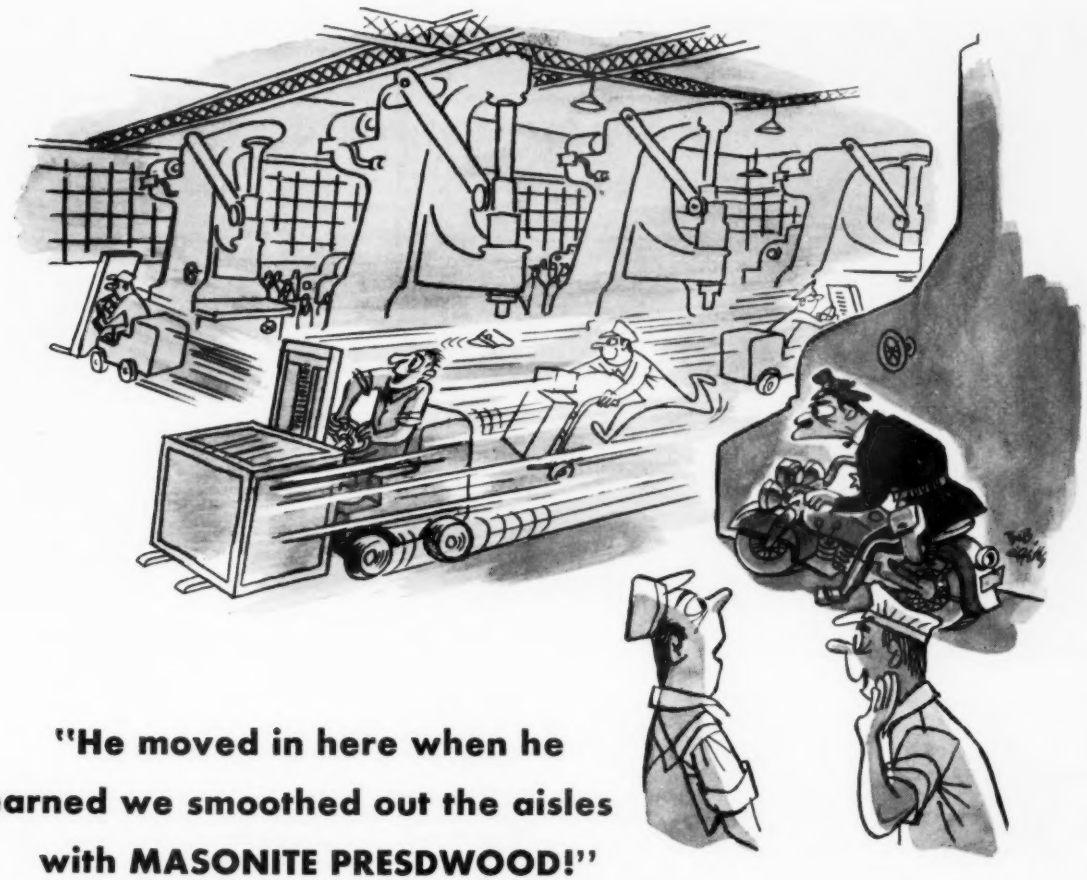
Pallet-To-Pallet Handling

Again, at the presses, the operators work pallet-to-pallet. Here the dried brick and the formed steel casings which have been brought to the operation in unit pallet loads, are combined and, in turn, accumulated on pallets of steel construction ready for the final production operation, drying, the changeover to steel pallets being made because the drying temperature approaches the char point of wood.

The full pallet loads of brick are picked up at the presses, carried to the adjacent tunnel dryers and set down on flange-wheeled dryer cars which operate on tracks extending through the tunnel dryers. Loaded cars are, in turn, pushed into the dryers by the industrial trucks. The magnitude of the production of chemically-bonded brick alone is indicated by the fact that 7000 steel pallets are required to accommodate the bricks which are in process or in storage at any one time.

Dryers are charged, one car at a time, at intervals prescribed to insure that each load of brick will be exposed to the drying temperature for the proper length of time. The action of pushing a carload of brick into the entry end of the dryer results in pushing a carload of dried brick from the discharge end.

These loads of finished brick, still on the steel pallets on which they were dried, are picked up from the dryer cars by the industrial trucks and carried to storage where they are



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all through the plant...

MASONITE PRESDWOOD

solves maintenance problems!

From trafficways to table tops, from partitions to pallets—there are dozens and dozens of ways to put Masonite Presdwood® to good use.

This smooth, grainless, all-wood hardboard is highly resistant to bumps, knocks and scrapes. Kind to hands, for it never slivers, splinters or cracks. Easy to cut, easy to apply. Its long life is a boon to your budget.

See your local building materials dealer for your immediate needs. And send for this free brochure for more money-saving ideas and information.

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"Masonite" signifies that Masonite Corporation is the source of the product

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Fig. 3. View of the plant's battery shop. The two charging benches, each accommodating eight batteries, are boxed in with sheet metal sides and ends

tiered. Not only do the trucks unload the car but, after unloading, the empty car itself is picked up and returned to the entry end of the dryers where it is set down on its track ready for re-use.

The pallet-truck system is similarly employed to carry, store and, of course, ship the fired brick which make up the remainder of the plant's output. This type of brick is fired on kiln cars in continuous-tunnel kilns. Following cooling, kiln car is moved on tracks, to unloading platforms where the brick is sorted, by type and size, onto the standard wooden pallets.

All of the electric industrial trucks in use at our plant are powered by Edison storage batteries. These were initially adopted as standard because of their inherent dependability and ability to withstand rough treatment. Another advantage which makes the batteries well suited to this service is the fact that they can be cooled rapidly during offshifts.

Shortly after the plant was put in operation, it became apparent that the combination of high summer temperatures in Baltimore, the high ambient temperatures in which the trucks work within the plant, and the volume and weight of the loads they carry were resulting in electrolyte temperatures higher than the recommended maximum of 115 F.

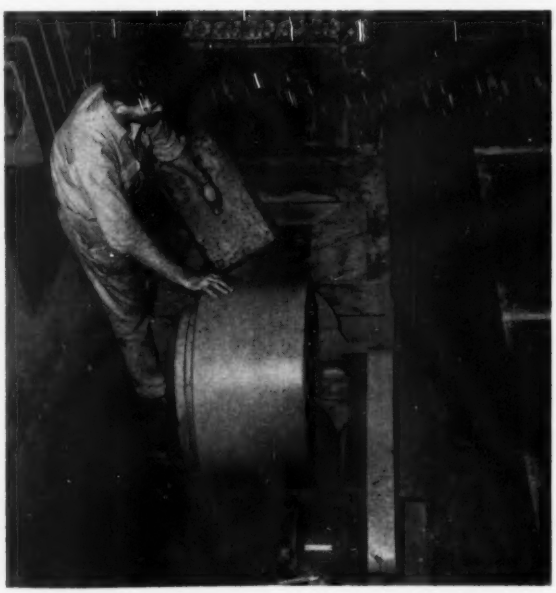
This problem has been solved by applying forced-draft ventilation to cool the batteries during the time that they are on the charging benches. To accomplish this, the two charging benches, each accommodating eight batteries, are boxed in with sheet metal applied to sides and ends. Rectangular ports at each battery-charging location on the tops of the benches and felt-faced closures have been constructed to seal off the bench locations when they are not in use. Blowers are located at one end of each bench.

The result has been that, during non-operating and charging intervals, the batteries are cooled by air, forced vertically, between the cells — thus bringing electrolyte temperatures down well within the safe operating range. During the winter months the system is not operated.

Other features of the battery shop include a power hoist, suspended by trolley from a monorail, which gives complete coverage to all batteries on both charging benches; a pulley and counter-weight arrangement for suspending charging leads above the charging benches where they are accessible when needed, yet cannot be damaged by the trucks, and a centrally located, overhead still and storage tank from which distilled water is made available to every bench space.

Fig. 4. The two charging benches are separated by an aisle so that battery compartments can be situated beneath hoist

Fig. 5. Forced-draft ventilation for cooling the truck batteries is supplied by two blowers, one on each charging bench



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TYPE 1300
GENERAL PURPOSE WIPING • DRY SURFACES • LIGHT OILS • ALL SOLVENTS
100 WIPERS • 12"x18" INCHES

Modernize your shop — save money — with new

Type 1300 KIMWIPES!

You'll be money ahead when you switch to Type 1300 Kimwipes. They're the modern new disposable wipers that actually replace old-fashioned cloth and waste wiping material and cost four to ten times less!

New Kimwipes 1300 are soft. Strong. Absorbent. A full 12" x 18" in size, they hold up to 8 times their own weight in liquids. They're non-abrasive, too. There's no holdover of metal chips or other infectious material that may cause dermatitis and loss of man hours. Type 1300 Kimwipes are absolutely clean to start with, and are disposed of after use. Ask your salesman for samples. And remember, there are two other kinds of Kimwipes you can choose from: Type 900-S (optical wipers) and Type 900-L (regular wipers). Save money. Order today!

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Supermarket for Aircraft Parts Speeds Movement of Parts to Assembly Point

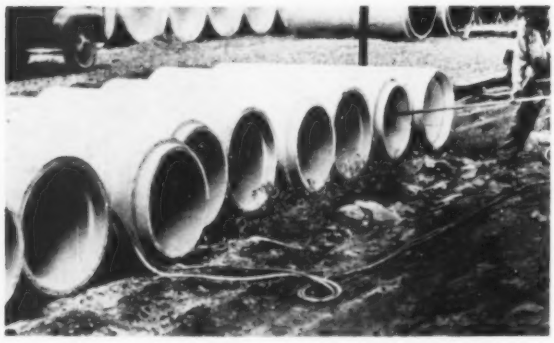
LOCKHEED AIRCRAFT CORPORATION'S Georgia Division plant at Marietta, Ga., has installed in its B-47 assembly area a giant self-service "supermarket" for issuing some 25,000 different kinds of aircraft parts to production workers.

Savings include a 25 per cent reduction in floor service and stock control personnel and 60,000 sq ft less floor space.

Aircraft parts travel from final fabrication points through a central distributing area and into some 1,000 bins and racks. These are located within a few feet—often within arm's length—of where workers actually install the parts in airplanes. This saves many steps and hours of time.

Acting as a "cash register" on the self-service bins are "shortage forecasts" which are made out weekly for each bin. These serve also as an inventory and combined with "parts inventory control lists" make it unnecessary to maintain elaborate card files usual in stock control when handling thousands of items.

Coated Concrete Pipe Resists Chemical Action, Carries Hydrocarbon Residues



LOW-COST CONCRETE PIPE carries off corrosive oil refinery wastes at the Esso Standard Oil refinery, Linden, N. J., in an economical system made possible by a new industrial coating. Based on highly inert Bakelite vinyl resins, and produced by Inertol, Inc., this coating permits the substitution of concrete pipe for expensive glazed pipe. Hydrocarbon residues flow freely through pipe lined with the coating.

Interiors of the pipe are sprayed with the coating before delivery, creating a smooth durable surface. Thousands of feet of the coated concrete pipe have been installed at the Esso refinery, with savings in both labor and material costs. The concrete pipe is available in sections longer than conventional sewage disposal pipe, and there are fewer joints to seal during the installation.

Mastic Coating Given Special "Tunnel Test"—Passes with Flying Colors

MASTIC COATINGS, designed to protect metal structures, equipment and piping from weather and chemical corrosion, are becoming increasingly attractive to plant engineering and maintenance departments.

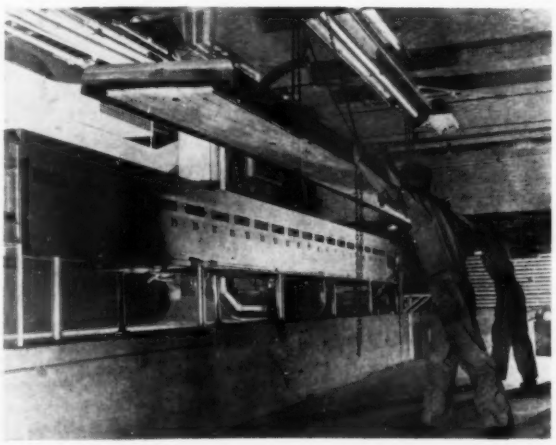
Until recently, however, no manufacturer had been able to offer a mastic coating which could be classified at less than 100 on the Underwriters' Laboratories' scale.

Benjamin Foster Co., Philadelphia, the manufacturer of Type 80 mastic, reports that their product is the first to be classified under 100. A ⅛-in. thick coat of this mastic on corrugated steel has been classified by Underwriters' Laboratories for flame spread in the range of 55 to 85. On asbestos-cement board a ⅛-in. coating of Type 80 mastic is classified at 25 to 30.

This material was tested by Underwriters' Laboratories in a special "tunnel test." In this test, the material to be tested actually serves as the roof of the furnace, see illustration. Three questions are answered by the test: (1) how fast a material burns over its surface; (2) how much fuel it contributes to the fire; and (3) how much smoke it makes.

To gage these results, the laboratory has established an arbitrary scale, where red oak wood (combustible) is 100 and asbestos-cement board (noncombustible) is zero.

The test method used is officially named "Standard Test Method for Fire Hazard Classification of Building Materials" and copies of this booklet, explaining how equipment is tested, are available at the various offices of the Underwriters' Laboratories.



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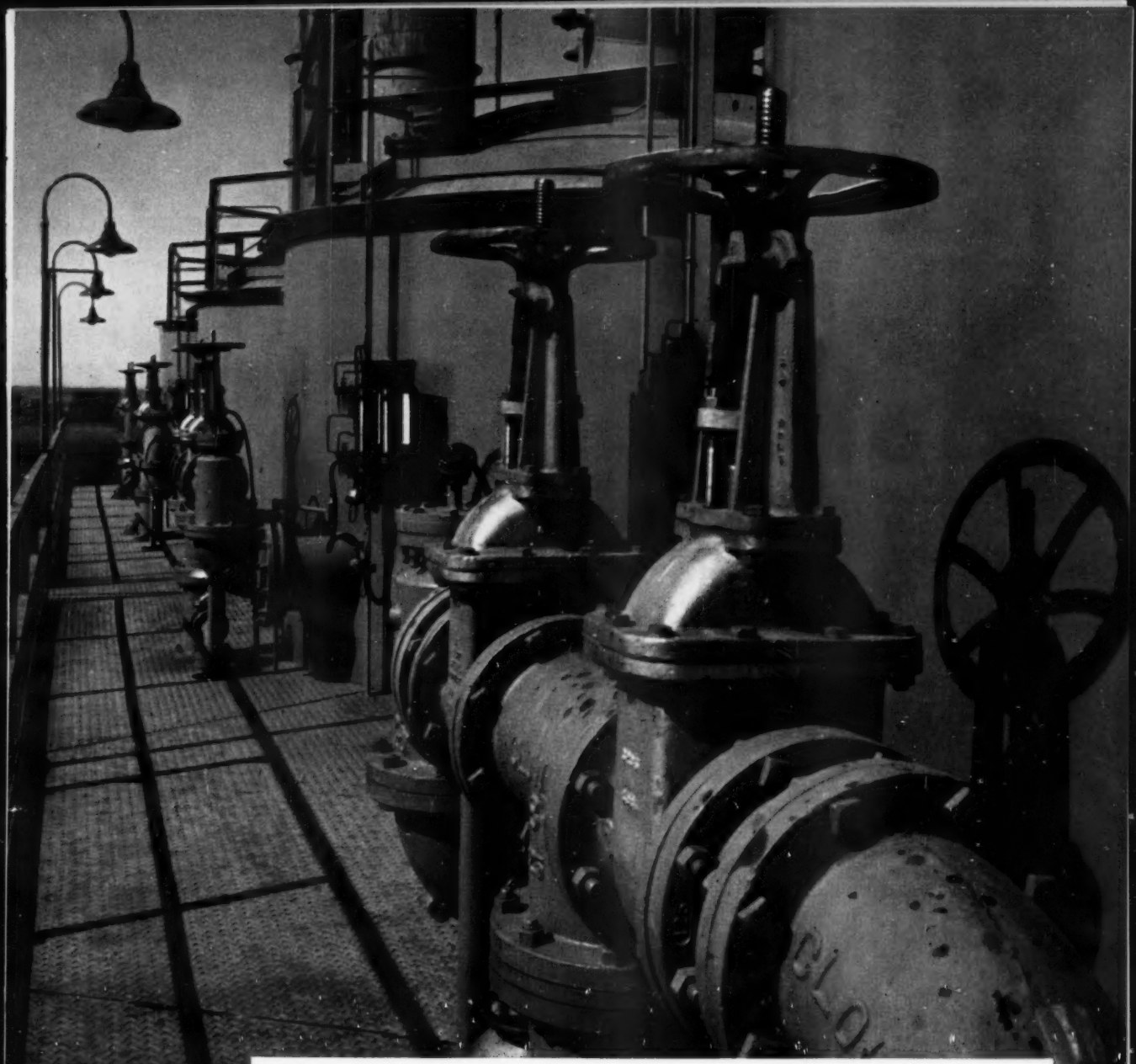


Sulfuric acid goes hungry here

Takes a pretty tough alloy to keep sulfuric acid on a starvation diet.

Yet these 8″ gate valves of corrosion-resistant *Aloyco 20* do just that. They control the acid flow to four large absorbing towers in U.S. Industrial Chemicals' new 300-ton acid plant. Built by Leonard Construction Company at Tuscola, Illinois, it supplies acid for National Petro-Chemicals Corporation and the general market. *Aloyco 20* valves are standard throughout the plant for handling sulfuric acid.

Here, as in scores of industrial processing plants, Aloyco Valves speed the flow of chemical progress. **Alloy Steel Products Co., Inc., 1301 West Elizabeth Avenue, Linden, New Jersey.** 4.4

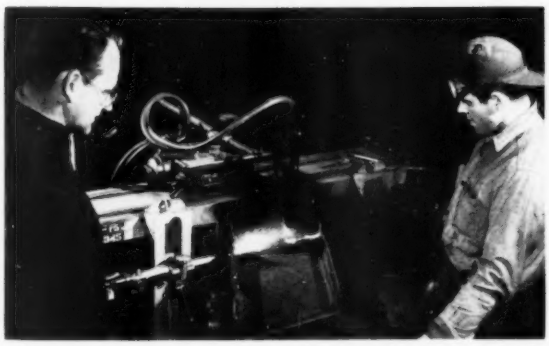
25TH ANNIVERSARY
Longer Lasting
ALOYCO
VALVES
1ST IN CORROSIVE SERVICE

Triple-Torch Beam Cutting Machine Speeds Steel Building Fabrication

CUTTING STRUCTURAL STEEL is now being done at a rate four times as fast as was possible with the conventional saw employed in steel fabricating plants. Designed by Luria Engineering Co., for use in their plants fabricating standardized steel buildings, a new machine attains record speed through the use of three oxy-acetylene torches. Feature of the machine is the mounting of the three torches, which cut heavy structurals on all sides simultaneously, at any angle, within 1/32 in.

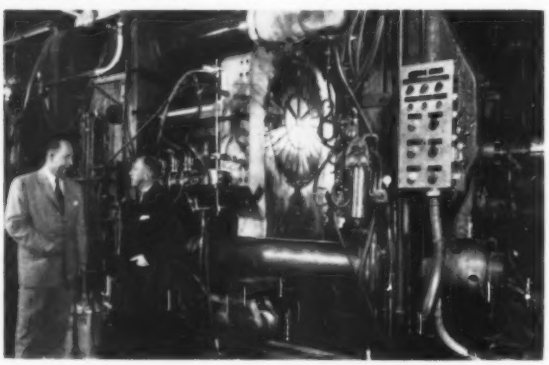
According to Luria engineers, the oxy-acetylene cutting machine burns through wide steel beams in less than two minutes, compared with an average of eight minutes for mechanical saws.

Set between two roller conveyor sections, which facilitate the handling of the beams, the cutting machine can be angled to suit the problem, and the three torches—one for each flange and one for the web—cut the steel beams quickly and safely. The resultant saving in labor costs is substantial, and the machine has made possible a speedup.



Die Casting Machine Combines Huge Size and Adaptability in Casting Aluminum

AS A MEANS OF PROVIDING the automotive industry with more and larger aluminum die castings, the largest die casting machine ever built was recently placed in operation in one of the plants of the Doehler-Jarvis Division of National Lead Co.



Requiring more than two years to construct, the machine was a joint development effort of Doehler-Jarvis and Kaiser Aluminum & Chemical Corporation.

Primarily designed for aluminum, it is capable of turning out aluminum die castings weighing up to 75 lb. When adapted to zinc use, castings up to 200 lb are contemplated. By previous die casting standards, zinc parts up to 45 lb and aluminum to 20 lb were considered practically maximum.

The machine weighs approximately 250 tons and will handle dies weighing up to 50 tons. Described as a 72-in. machine, this dimension represents the distance between centers of the four guide bars which form the essential framework of the die casting machine.

It is estimated that on a casting job weighing 75 lb in aluminum, the 72-in. machine could operate at a production rate of 30 "shots" per hour, and would consume in excess of 2250 lb of metal per hour. To cope with this high rate of metal consumption, the machine has been equipped with two 12,000-lb reverberatories, and a newly-developed automatic ladle with built-in temperature controls.

Koroseal Film Functions as Vapor Barrier in Fire-Retardant Roof

FIRE-RETARDANT Koroseal flexible material is being used in a new roof construction which may prevent disastrous industrial fires.

Developed by Lexsuco, Inc., the new roof construction utilizes a vapor barrier of the Koroseal, manufactured by B. F. Goodrich. One of the first major installations is that on the new Ford Motor Co. plant in Brookpark, Ohio.

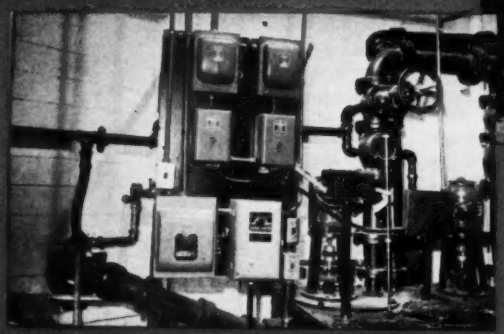
According to Goodrich spokesmen, the vapor barrier roof construction prevents drippage of inflammable asphalt or tar from a burning roof during a fire, and eliminates all combustible materials between roof deck and insulation.

At Ford's plant, 500,000 sq ft of roof will be covered with the new construction. The installation consists of standard steel decking, on which the vapor barrier is laid. The Koroseal is a black film, 0.004 in. thick, furnished in easy-to-handle rolls. This is followed by a conventional roof insulation, fastened to the steel deck with Lexsuco insulation clips of steel.

Parlon Stays On!

"Selected over 100 other paints"

FOR STATION CEILINGS—A single coat of paint based on Parlon gives excellent coverage, good reflectance to the station ceilings of Toronto's new $50,000,000 subway. Ten-foot candles of light, glistening walls of bright-colored ceramic tile and stainless steel, and ceilings that will keep that "just painted" look, provide the subway platforms with a sparkling clean appearance.



FOR MAINTENANCE ROOMS—Like the station ceilings, the maintenance room at each station is painted with a Parlon-based paint manufactured by Lowe Brother Company, Limited, Toronto. Again, a single coat was sufficient, not only on the concrete walls and ceilings, but for the duct work and piping as well.

When planning was first begun on the new Toronto subway, more than 4 years ago, one problem was the selection of a suitable paint for station ceilings. After tests conducted with over 100 finishes, a paint based on Hercules Parlon (chlorinated rubber) was the choice.

What Toronto needed was a finish that could be applied quickly — in a single coat if possible, and remain relatively free from condensed moisture during periods of high humidity. The final choice was between the paint of two different manufacturers. Both were based on Parlon!

Wherever exteriors or interiors . . . metal, concrete or wood surfaces . . . must be protected by a finish that withstands corrosion, Parlon-based paints give outstanding service at lower long-term costs. See your paint supplier or write Hercules for details on Parlon-based paints.

Cellulose Products Department **HERCULES POWDER COMPANY** *966 Market St., Wilmington 99, Del.*

LOOK FOR THIS LABEL ON THE PAINT CAN . . .

MADE WITH **Parlon®** HERCULES® CHLORINATED RUBBER

PARLON CHLORINATED RUBBER PAINTS ARE AVAILABLE FROM 400 MANUFACTURERS UNDER THEIR OWN BRAND NAMES

Plant Conversion Required for Switch from Tractors to Howitzers

RECEIPT OF A DEFENSE CONTRACT to build self-propelled 155mm howitzers for the Army Ordnance Corps plunged the Massey-Harris Co., farm machinery maker in Racine, Wisconsin, into an elaborate plant conversion.

A large warehouse being used to store tractor parts was vacated and put to use both as housing for the heavy machine tools necessary in the Army vehicle manufacture, and as the main assembly area. The warehouse height, which allowed installation of a 20-ton crane, also proved valuable since it permitted lifting one vehicle over another in the process of assembly.

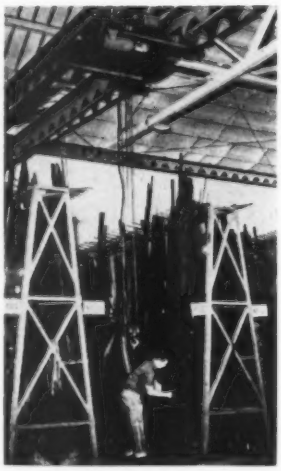
Rental of additional buildings in the area was necessary to house the material taken from the warehouse. In addition, a new building providing 170,000 sq ft of floor space, was constructed for use as a "feeder" building for the assembly area. From this building, parts and sub-assemblies are moved into the main assembly area.

Culmination of the entire program was the recent introduction of the completed vehicle at the plant test track.

Overhead Crane System Handles Steel

OVERHEAD Trambeam crane system in Crucible Steel Co.'s Los Angeles warehouse is controlled by a pendant push-button which makes it possible for the operator to "follow" his load. It is particularly advantageous when handling steel stacked vertically.

The operator can take the crane into the four-foot aisle, select the piece of steel required, and move it out again into the main bay area quickly. Trambeam system is manufactured by the Whiting Corp., Harvey, Ill.



Water Stream Checks Blades

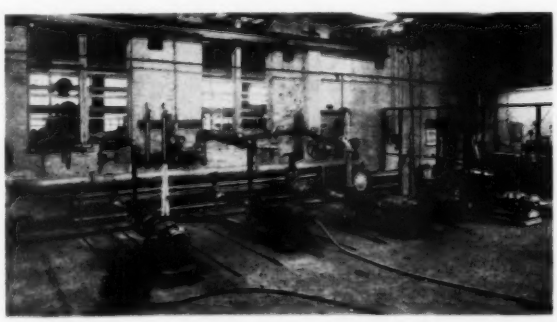
HIGH VELOCITY water flow within clear plastic nozzles, is used by the Transmission Group of the General Motors Engineering Staff to study effects of turbine blade shapes and settings for possible use in automobile torque converters and automatic transmissions. Engineers can not only make visual checks through the transparent nozzle, they can also take high speed photos as they analyze various blade shapes and angles under actual flow conditions. The installation is at GM's Technical Center.

Manufacturer's Laboratory Checks Pumps Under Simulated Operating Conditions

THOROUGHLY TESTING every centrifugal pump before shipment assures each customer of Dean Bros. Pumps, Inc., that the pump will live up to its claims. Test conditions closely simulate actual conditions under which the pump will operate on the job, and furthermore, recording the performance data on each pump gives complete information for the head capacity curve.

Dean Brothers has installed a fully equipped pump test and research laboratory in its Indianapolis, Indiana plant. The facilities consist of a closed system in which water is circulated by the pump under test. Water flows from a large pressure-tight surge tank to the pump suction inlet. Suction pressure and pump discharge pressures are measured, and flow rate is controlled by a throttle valve in the pump discharge line.

The water passes through venturi meters which indicate the flow rate directly in gallons per minute. With power requirements being measured by using cradle mounted motors as dynamometers, accurate efficiency values are obtained for each pump, before it leaves the plant.



MECHANIZE 4 Scrubbing Operations into 1

with a COMBINATION SCRUBBER-VAC!

Here's a timely answer to the need for reducing labor costs—*a single cleaning unit that completely mechanizes scrubbing.* A *Combination Scrubber-Vac* applies the cleanser, scrubs, flushes if required, and picks up—*all in one operation!* Maintenance men like the convenience of working with this single unit . . . the thoroughness with which it cleans . . . and the features that make the machine simple to operate. It's *self-propelled,* and has a *positive* clutch. There are no switches to set for *fast* or *slow*—slight pressure of the hand on clutch lever adjusts speed to desired rate. The powerful vac performs quietly.

Model 213P at left, for heavy duty scrubbing of large-area floors, has a 26-inch brush spread, and cleans up to 8,750 sq. ft. per hour! (Powder Dispenser and Level Cable Wind are optional.) *Finnell* makes *Scrubber-Vac Machines* for small, vast, and intermediate operations, and in *gasoline* as well as *electric* models. From this complete line, you can choose the size and model that's exactly right for *your* job (no need to *over-buy* or *under-buy*). It's also good to know that you can lease or purchase a *Scrubber-Vac,* and that *a Finnell Floor Specialist and Engineer is nearby* to help train your maintenance operators in the proper use of the machine and to make periodic check-ups. For demonstration, consultation, or literature, phone or write nearest *Finnell Branch* or Finnell System, Inc., 5309 East Street, Elkhart, Indiana. Branch Offices in all principal cities of the United States and Canada.

FINNELL SYSTEM, INC.

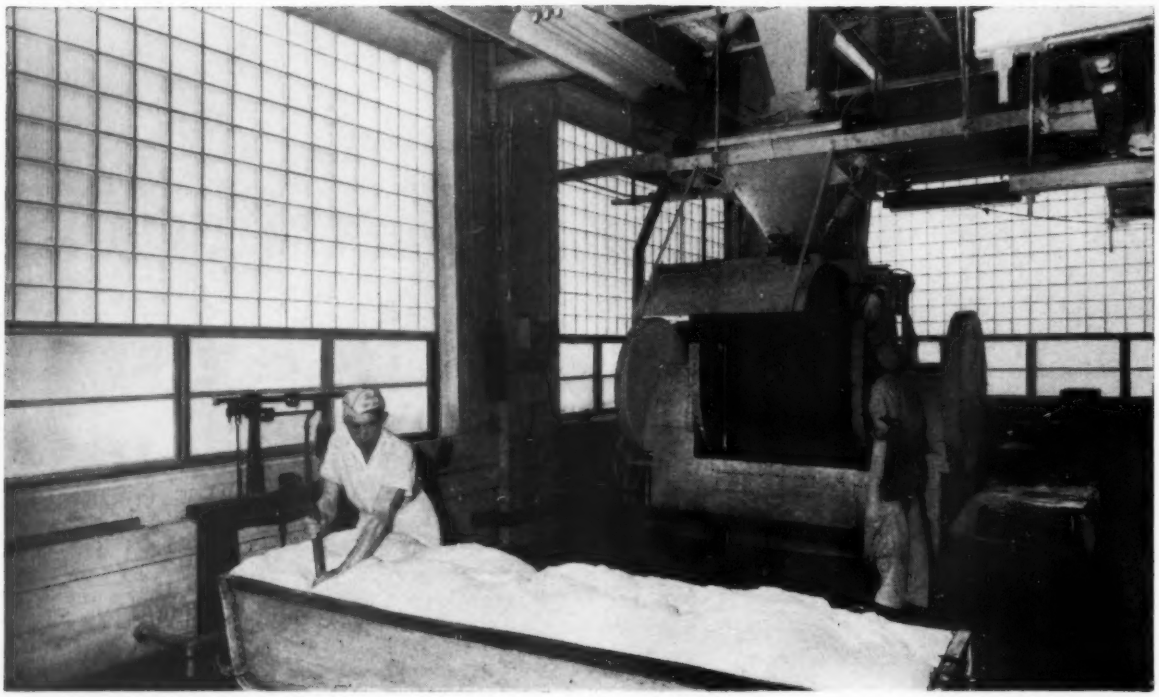
Originators of Power Scrubbing and Polishing Machines

Everything FINNELL for Floor Care

BRANCHES IN ALL PRINCIPAL CITIES

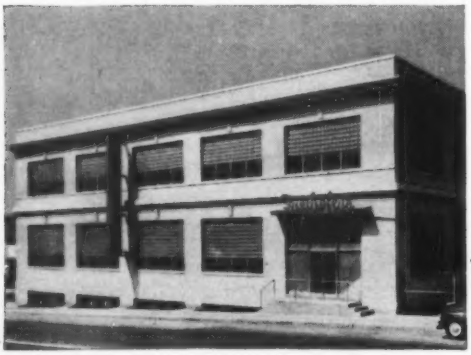
For more facts circle 580 on Reply Card

Bakery saves dough...
with PC Glass Blocks



This was the old building . . . ▲ . . .

. . . ▼ . . . Here is the new



One big problem in a bakery is holding the temperature constant while the dough ferments or rises. At Wilmington, Delaware, the Wm. Freihofer Baking Company had trouble because cold air seeped through the rotted and buckled wooden sash.

After the PC Glass Blocks were installed, William Schilling, Production Manager said, "In 25 years on the job, I haven't seen anything better than these glass blocks for holding temperature and saving the dough. They have fine insulation value."

Freihofer has also saved all the money they used to spend freeing jammed windows, replacing sash cords and re-puttying window panes. Nothing has to be painted anymore. The panels are only washed once or twice a year. Venetian blinds have been eliminated (you seldom need them with PC Glass Blocks).

Freihofer Baking Company has *already* been using PC Glass Blocks for 5 years in two other plants. And according to P. Arthur Robinson, Executive Vice-President, "When we remodel any of our other 7 plants or build new ones, PC Glass Blocks will certainly be used."

For more information, write to Pittsburgh Corning Corporation, Dept. PG-94, One Gateway Center, Pittsburgh 22, Pennsylvania.

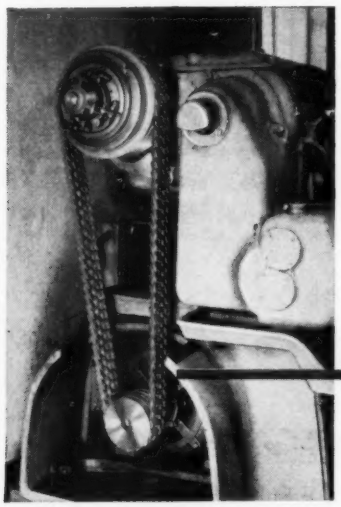
PC Glass Blocks

PITTSBURGH ® PC CORNING

ALSO SKYTROL* AND FOAMGLAS®

*T. M. Reg. Applied For

For more facts circle 581 on Reply Card



Performance Proves

20% to 90%

LESS VIBRATION

with Veelos—the Balanced V-belt

Engineers have long known that there are four principal causes of machine vibration: 1. bearings; 2. motor; 3. clutch; 4. sheaves. Often overlooked is a fifth cause: v-belts. And, in many instances, *v-belts alone* are the major cause of vibration.

There's a logical reason for this.

Regular v-belts have spots of varying density due to their construction. Normally, these spots are not apparent, yet they throw the belt out of balance when the drive is operating. As a result, vibration is created that can damage bearings, shafts and, most important, the finished work.

This is not true of Veelos v-belts.

Veelos is absolutely uniform throughout its entire length. Every link and every stud is identical. The smooth, machine-cut sides and the laminated construction assure smooth, vibrationless power delivery. Veelos is perfectly balanced.

In case after case, installation of Veelos v-belts has reduced machine vibration 20% to 90%.

Proof that Veelos will reduce vibration can easily be demonstrated with an electronic vibration analyser. This analyser measures amplitude of vibration to as low as 2-millionths of an inch.

Fifteen minutes of your time is all that is required to show you with the electronic analyser that Veelos creates less machine vibration. Drop us a line or clip the coupon for a demonstration.

VEELOS
THE LINK
V-BELT

Manheim Manufacturing & Belting Company
652 Manbel St., Manheim, Pa.

Yes, I would like a demonstration. **Have your representative call me for a convenient time.**

Name.....

Company.....

Address.....

.....

ADJUSTABLE TO ANY LENGTH • ADAPTABLE TO ANY DRIVE

Veelos is known as Veelink outside the United States.

2CV

For more facts circle 582 on Reply Card

YOU NEED A STAND-BY

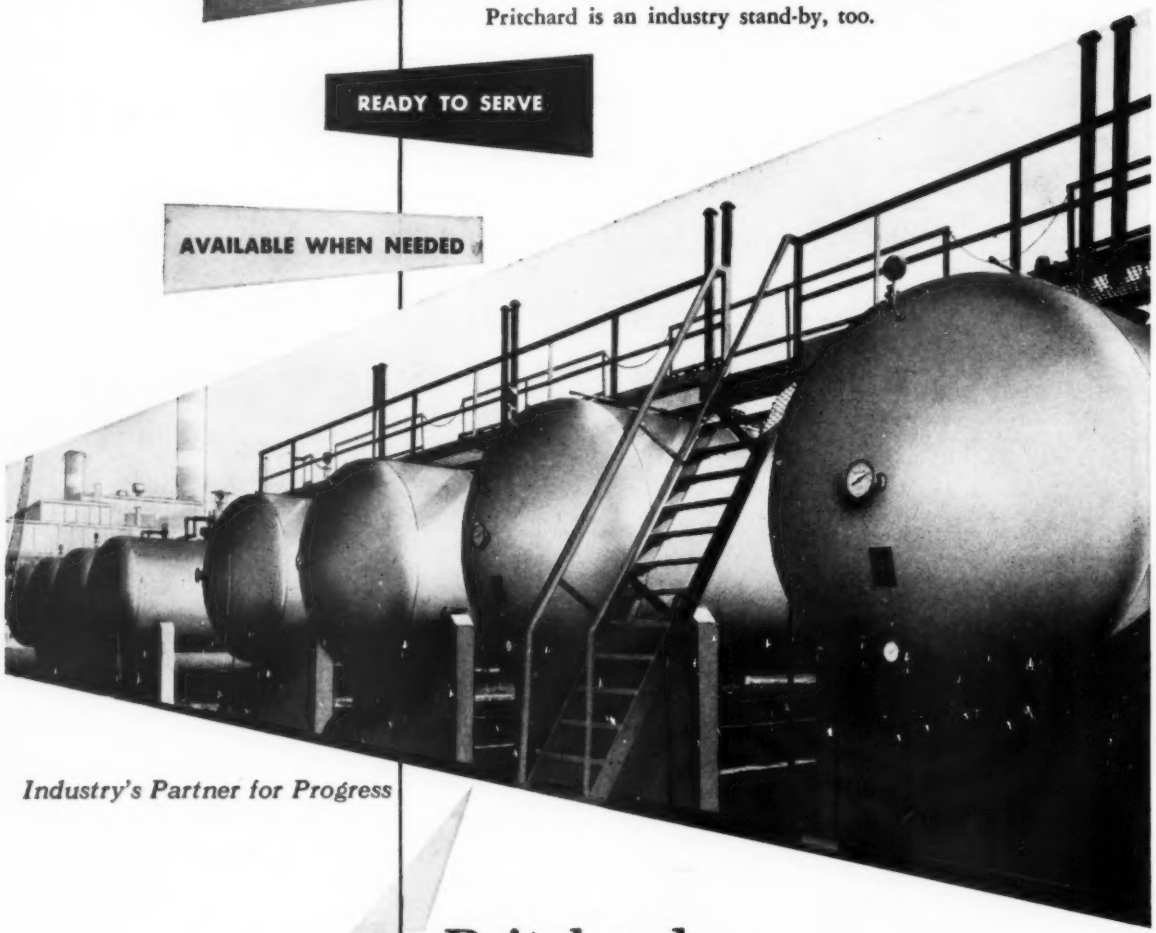
That's why Ford Motor Company has this line-up of propane storage tanks standing by at their Cleveland plant. Ford wanted an *assured* fuel supply at all times.

And why did Ford choose Pritchard to build its complete propane-air stand-by installation? Simply because the exceptional experience and abilities of Pritchard engineering and construction specialists has been proved on dozens and dozens of similar jobs. You see, Pritchard is an industry stand-by, too.

DEPENDABLE

READY TO SERVE

AVAILABLE WHEN NEEDED



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J.F. Pritchard & Co.

ENGINEERS • CONSTRUCTORS

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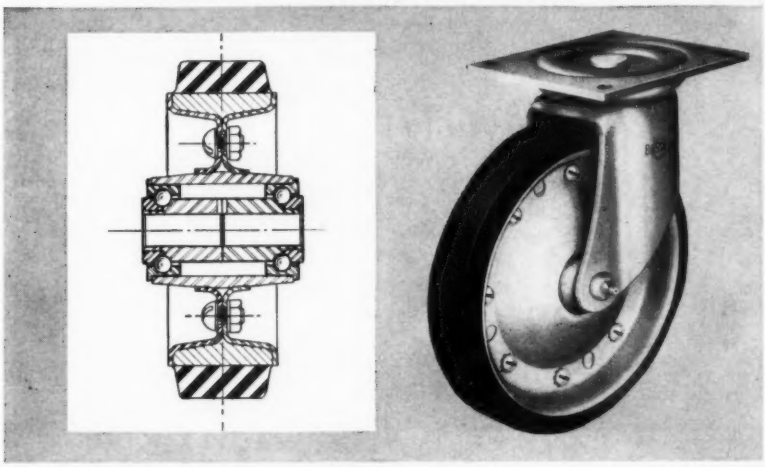
MATERIALS-HANDLING NEWS

★ Panel Discussions by Bassick, World's Largest Manufacturer of Casters and Floor Protection Equipment ★

Improved rubber-tire caster handles high-shock loads



Unit design of bearings permits easy handling of bearing assembly when disassembling wheel. Bearings cannot be preloaded or misaligned in mounting wheel.

Rubber-tired disc wheels and double ball-bearing hubs feature new design innovations. Easy to disassemble; replaceable tire, disc and bearing assembly.

New design better eight ways

Bassick's medium-heavy-duty and medium-duty casters with demountable rubber tires feature *eight* improvements which make them top choice for heavy institutional applications.

1. **File-hard** (15N90 Rockwell hardness) bearing surfaces provide longer wear and service life, precluding premature failure.
2. **Permanently adjusted double-ball bearings** never require adjustment or realignment, unlike cone and cup design.
3. **Inner race construction** prevents pre-loading of bearings when axle nut is tightened, prevents misalignment during mounting of wheel.
4. **Unit bearings** can't fall apart when disassembling wheel.
5. **Completely replaceable** tires, discs and unit bearings.
6. **Electroplated** steel discs, bolts, lock washers, nuts have zinc or cadmium finish to resist corrosion — superior to paint.
7. **High-tensile rubber treads** vulcanized on hard non-stretching tread base.
8. **Alemite lubrication fittings** are standard, except on milk case dolly casters, which have flush-type lubricators.

You can order this new caster in Series 68, H68, and H99, swivel and matching rigid types, in 3½", 5" and 8" wheel diameters. For operational loads from 140 to 350 lbs. each. Full details in Catalog No. 4R-54. Facts on Sealed Swivel casters are yours in Catalog 3D99-53.

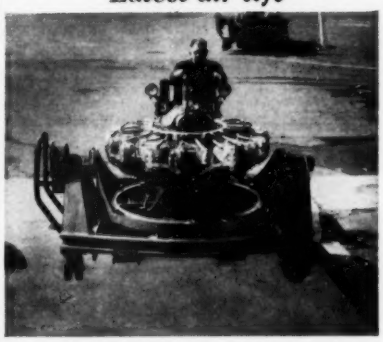
SERIES H99 swivel caster with demountable rubber tire, double-ball-bearing action for easy swiveling. 5" and 8" wheel diameters; loads, 250 and 350 lbs. each.

SERIES H68 swivel caster. Full case-hardened (15N90 Rockwell) bearing surfaces for extra wear (as in H99). 3½" and 5" wheel diameters; loads, 140 and 180 lbs. each.

So tough that file won't bite

You get extra service from Bassick steel casters case-hardened to 15N90 Rockwell hardness — even a file can't cut raceway surfaces.

Latest air lift



At AVCO's Lycoming Division, Stratford, Conn., they've come up with an unusual technique for handling the aircraft engines produced there.

Engines are assembled on a stand equipped with special dual-wheel Bassick casters designed for extreme heavy-duty service. Since these particular forged steel casters aren't built for road speeds, Lycoming engineers had to figure out a faster way of getting the stands from one plant area to another.

Wheels within wheels

You see their solution above. Fork-lift trucks snatch up the engine stand, casters and all, then whiz it off to the next station, where the casters take over low-speed movement. Result: No snail's pace progress between stations; no slow-down in production.

Ask the Bassick man

For the answer to *your* materials-handling problems, why not start with the man who handles the world's largest line of casters—your Bassick distributor. Whenever you want to move something, put it on Bassick casters — they deliver the goods. He'll be glad to show you how. Call your Bassick distributor.

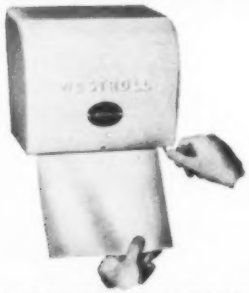
THE BASSICK COMPANY
Bridgeport 2, Conn.
In Canada:
Belleville, Ont.

Bassick
A DIVISION OF STEWART SW WARNER
MAKING MORE KINDS OF CASTERS . . . MAKING CASTERS DO MORE

75 YEARS OF CASTER LEADERSHIP

For more facts circle 584 on Reply Card

eliminate towel waste with WESTROLL!



The Westroll towel dispenser has relatively few working parts, so its maintenance factor is negligible. Westroll dispensers are streamlined, easy to keep clean. They assure a constant supply of towels, help keep washrooms spic and span, save costly janitors' time.

It's human nature to take advantage of an overly generous paper towel dispenser. Particularly so with interfold or flat towels where two, three or even four are used for one drying. But with Westroll, people tend to take just enough and no more. You save as much as 40% on towel costs.

Tests show Westroll users average only 17 inches of paper, against 22, 33, or 44 inches of interfold. Users can crank out exactly the amount of towel necessary – even as little as two inches for lipstick removal! These are immediate savings.

You also save on maintenance. One filling of a Westroll micromatic dispenser is equivalent to *four* fillings of the ordinary flat-towel dispenser. Westroll dispensers are loaned and maintained by West.

Westroll towels are outselling our interfold towels 20 to 1. No customer has ever switched back to interfold towels after trying Westroll!

WEST DISINFECTING Company

42-16 West Street, Long Island City 1, N. Y.

WANT DETAILS?

Tear out this coupon and mail with your letterhead

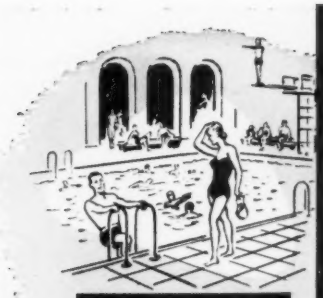
Dept. 52

I'm interested in:

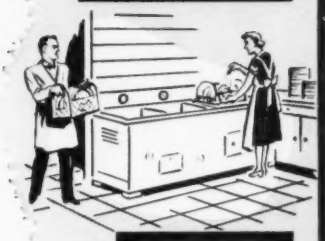
☐ A FREE leaflet on WESTROLL.

☐ A talk with a West expert about my washroom problems. No sales pitch. No obligation. Just discussion and a demonstration if I want it.

For more facts circle 585 on Reply Card



SWIMMING POOLS



DISHWASHERS

SHOWERS

Fast, Dependable Action from ADSCO WATER HEATERS

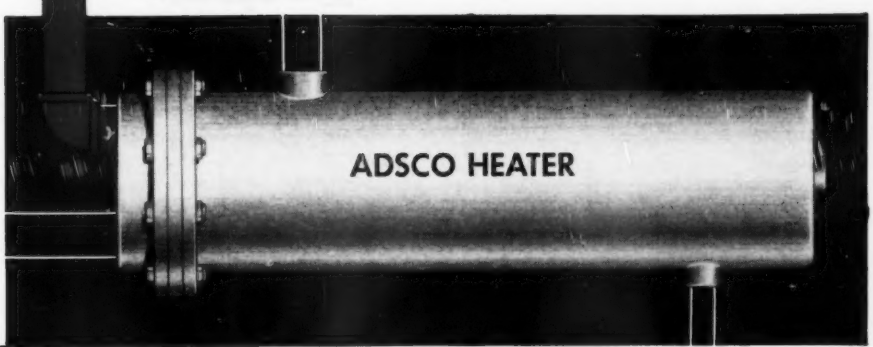
SPACE HEATING

WASH ROOMS

LAUNDRIES

Hot water! Plenty of hot water! When and where you want it... and at low cost! ADSCO Water Heaters are dependable sources of hot water in any type of plant or building wherever there is a steam supply. Use ADSCO Water Heaters for space heating, for process hot water, or for such general service as showers, laundries, dishwashers, swimming pools...even for snow melting. Write today for Bulletin 35-77 on Convertors, or Bulletin 35-78 on Instantaneous Heaters.

Where storage heaters are needed, write for ADSCO Bulletin 35-75.



ADSCO ENGINEERED PRODUCTS

AMERICAN DISTRICT STEAM COMPANY, INC.

GENERAL OFFICES
NORTH TONAWANDA, NEW YORK
PLANTS: NORTH TONAWANDA, N. Y. – RICHMOND, CALIF.

FOR THE DISTRIBUTION AND UTILIZATION OF STEAM, LIQUIDS AND GASES

EXPANSION JOINTS | SEPARATORS | METERS | STEAM TRAPS | STORAGE HEATERS | STRAINERS

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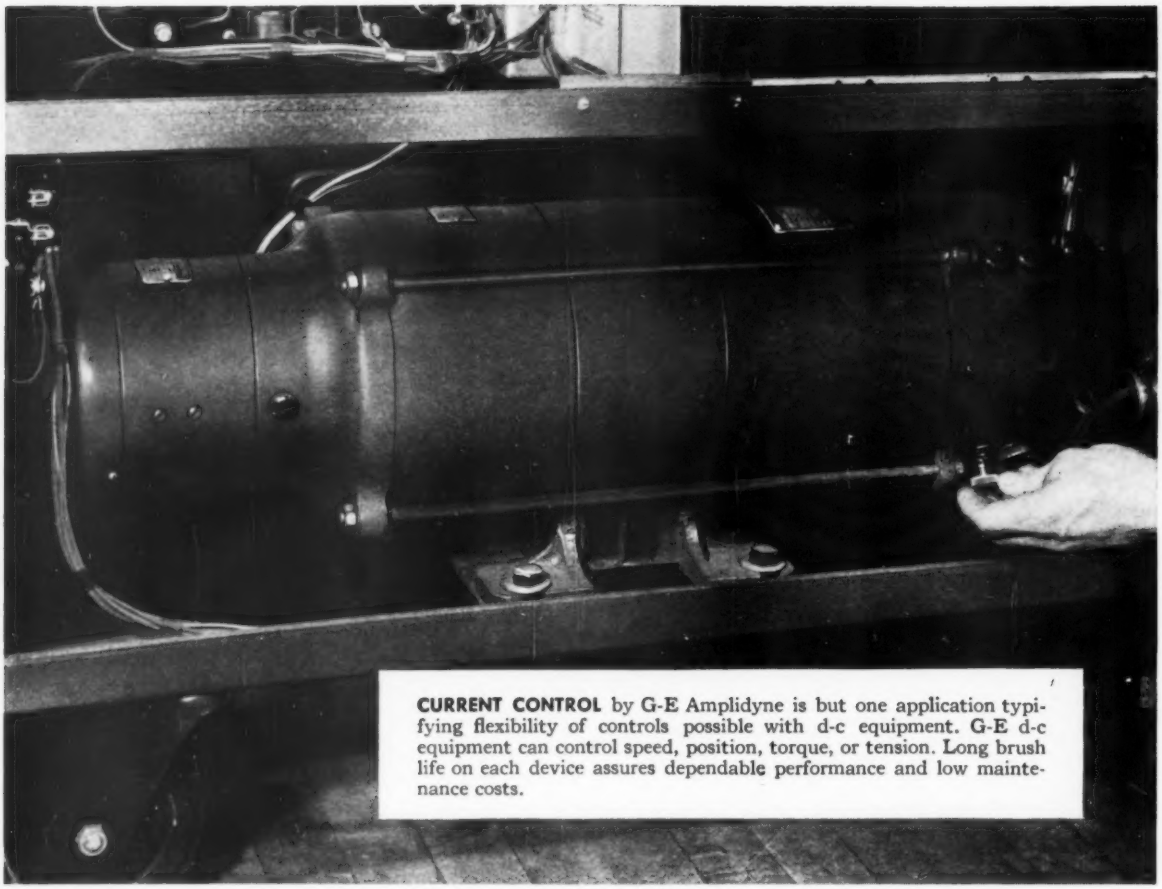

CURRENT CONTROL by G-E Amplidyne is but one application typifying flexibility of controls possible with d-c equipment. G-E d-c equipment can control speed, position, torque, or tension. Long brush life on each device assures dependable performance and low maintenance costs.

Use G-E amplidynes for accurate process control

G-E AMPLIDYNES, like the one shown above, are versatile d-c power amplifiers with near-instantaneous response—designed to give fast, accurate control of position, current, voltage, speed or tension.

Versatility of d-c equipment gives you more effective and economical use of your expensive production machinery. For example, wide speed range is readily available because of the adjustable-speed characteristics of direct-current motors; other G-E d-c products like amplidynes, tachometer generators, motor-generator sets, and Thy-mo-trol* drives can help you solve even more production problems.

APPLICATION ENGINEERS at G.E. are anxious to help you get efficient control systems. For more information on this service and on d-c equipment, see your local G-E Apparatus Sales Office or Authorized G-E Distributor. General Electric Company, Schenectady 5, N. Y. 704-12

*Reg. Trademark of General Electric Co.

Progress Is Our Most Important Product

GENERAL ELECTRIC

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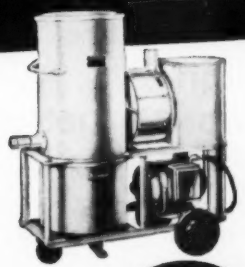
This unretouched photograph graphically shows Invincible's remarkable cleaning power.

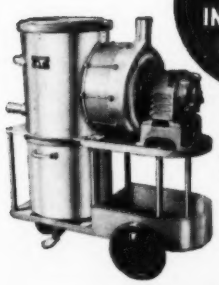
This ½" H. P. Invincible All Service Cleaner is equally efficient on wet or dry pick-up.

INVINCIBLE... in name and service

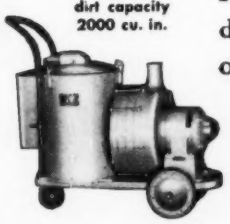


Model 809-B
5 H.P.,
dirt capacity
3 cu. ft.

SOME OTHER INVINCIBLE MODELS



Model 460
1½ H.P.,
dirt capacity
3020 cu. in.



Model 415-A
1½ H.P.,
dirt capacity
2000 cu. in.

Harmful dust and dirt in your plant can be removed faster, with less manpower and at lower cost by Invincible Vacuum Cleaners. The result: better working conditions and less damage to equipment and product.

Invincibles also efficiently remove or recover scores of other industrial materials.

Reliable, heavy duty Invincibles have served industry more than 40 years. Let us make a survey of your cleaning or reclaiming requirements.

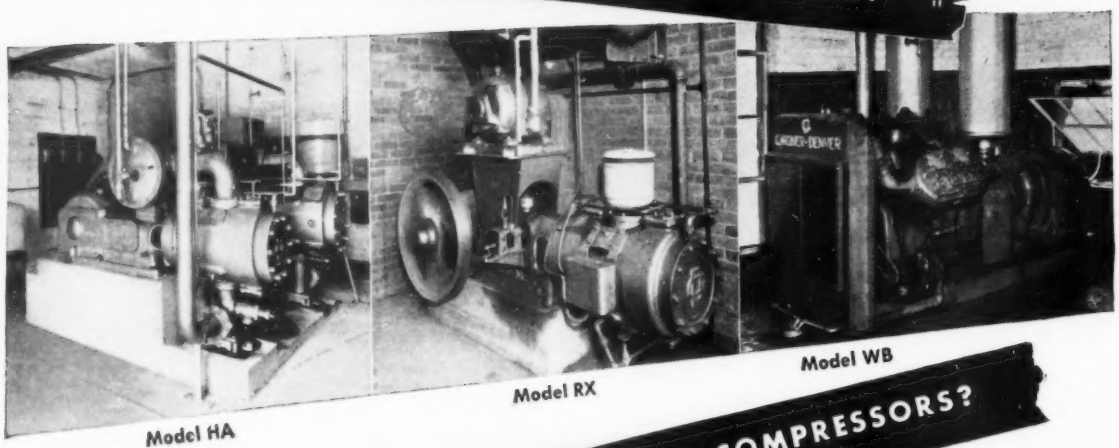
FREE BOOKLET
tells how Invincibles save money in every type of industry. Write for it NOW!

INVINCIBLE VACUUM CLEANER MFG. CO.
DOVER, OHIO

OVER 50 YEARS THE LEADER IN INDUSTRIAL VACUUM EQUIPMENT

For more facts circle 588 on Reply Card

NEED A CENTRAL COMPRESSED AIR SYSTEM?

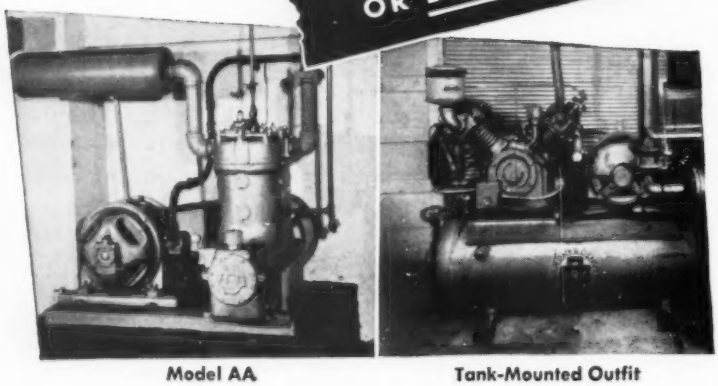


Model HA

Model RX

Model WB

OR DEPARTMENTAL COMPRESSORS?



Model AA

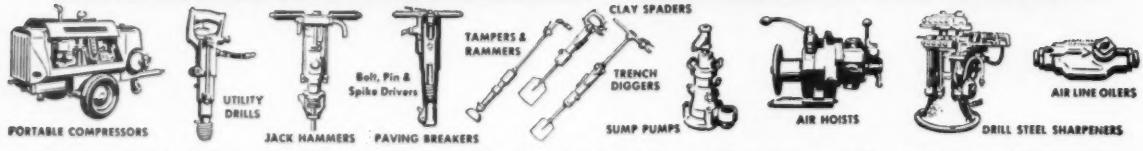
Tank-Mounted Outfit

call on GARDNER-DENVER

for expert advice in planning your compressed air system — and for quality compressors to meet your capacity and pressure requirements. Write today!

SINCE 1859

GARDNER-DENVER



THE QUALITY LEADER IN COMPRESSORS, PUMPS AND ROCK DRILLS FOR CONSTRUCTION, MINING, PETROLEUM AND GENERAL INDUSTRY

Gardner-Denver Company, Quincy, Illinois

In Canada: Gardner-Denver Company (Canada) Ltd. 14 Curity Avenue, Toronto 16, Ontario

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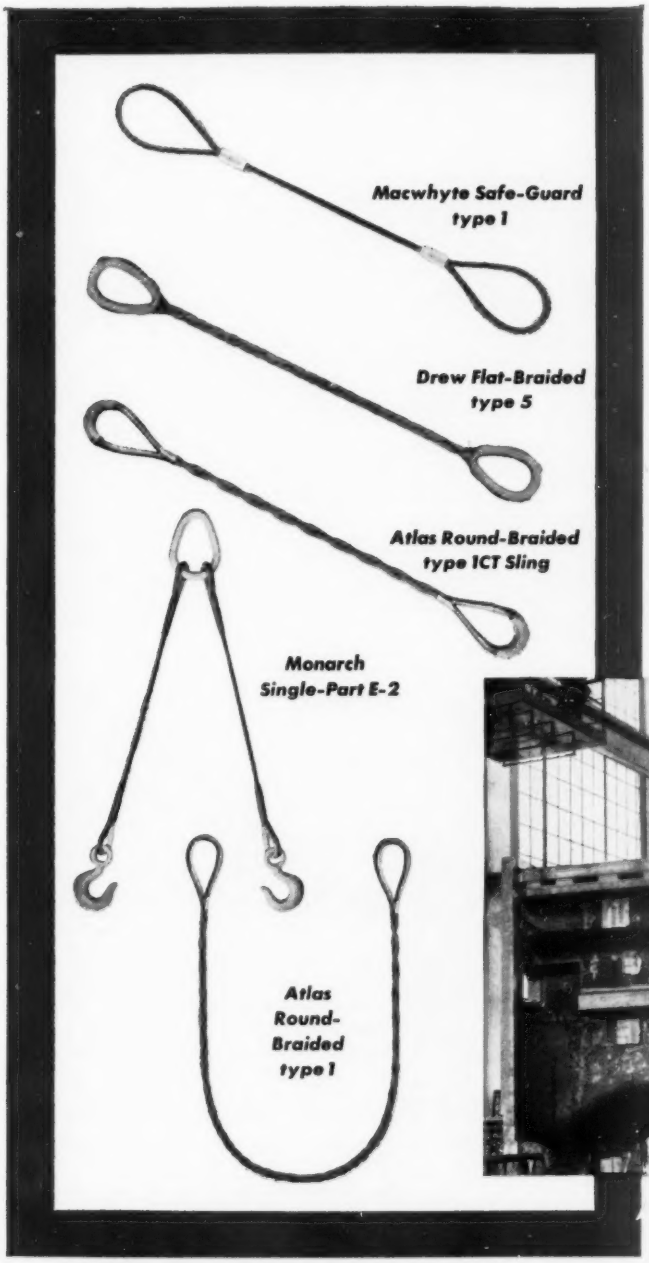

Macwhyte Safe-Guard type 1
Drew Flat-Braided type 5
Atlas Round-Braided type 1CT Sling
Monarch Single-Part E-2
Atlas Round-Braided type 1

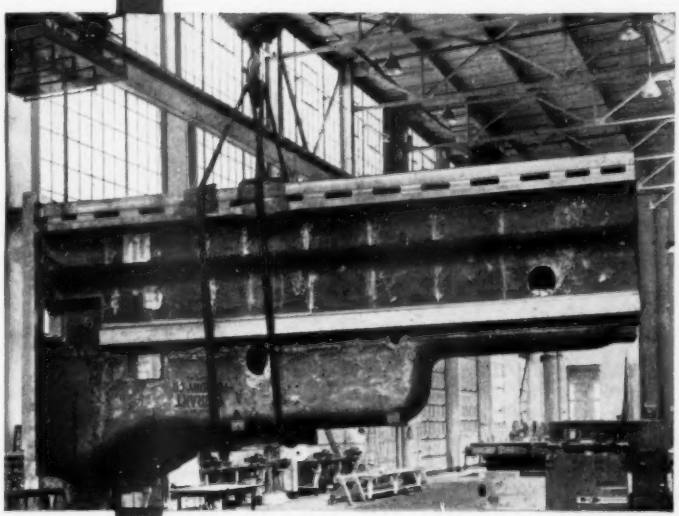
Macwhyte Slings

any type . . . any size your job requires

Here are some of the hundreds of slings available to you. Macwhyte slings cover a full range of sizes and designs in three body types: round-braided, flat-braided, single-part. These slings are made to order with fittings needed.

For greater flexibility, safer gripping, and longer sling life, Macwhyte *Atlas* Slings are "balanced-braided" and (1) Ropes are spliced endless before braiding. (2) Right lay ropes balance left lay ropes. (3) All ropes follow uniform spiral paths, assuring balanced tension throughout the sling body. And under load, there's no kinking . . . no spinning in an *Atlas* Braided Sling.

Macwhyte engineers will study your sling needs and give you the benefit of their broad experience. Ask for recommendations and quotations.



Macwhyte MONARCH Cable-Laid Grommets handling large casting

MACWHYTE SLINGS

Send for Sling Specification Folder No. 5308

For cranes and hoists specify PREformed Monarch Whyte Strand Crane Rope made by Macwhyte

Mill depots: New York • Pittsburgh Chicago • St. Paul • Fort Worth • Portland Seattle • San Francisco • Los Angeles Distributors throughout U.S.A.

MACWHYTE COMPANY

2991 Fourteenth Avenue

KENOSHA, WISCONSIN

Manufacturers of Internally Lubricated PREformed Wire Rope, Braided Wire Rope Slings, Aircraft Cable, Safe-Lock Assemblies, Monel Metal and Stainless Steel Wire Rope.

1059-S

For more facts circle 590 on Reply Card

NEW PRODUCTS AND PROCESSES summarized for your convenience

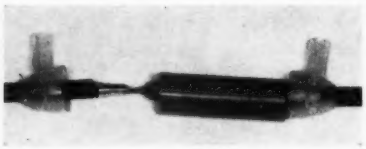
Edited by M. E. Heniken

1—CABLE SPLICING KIT utilizes liquid epoxy resin

With Scotchcast Splicing Kit 82A you can make a cable splice quickly, easily —and anywhere. The method involves embedding the splice in liquid epoxy resin that hardens into a hermetically sealed casting. No heat is required, and all materials needed for a cast splice in single conductor wire from sizes 10 to 4 AWG are in the kit. The epoxy resin utilized (Scotchcast electrical embedment resin No. 4) is packaged along with the right proportion of hardener in a plastic self-mixing envelope, the Unipak. Also in the kit is a three-piece vinyl plastic single-use mold; two different-sized Scotchlok electrical spring connectors; a strip of abrasive cloth for cleaning the conductor; and an instruction sheet. The only tool needed is a pocket knife.

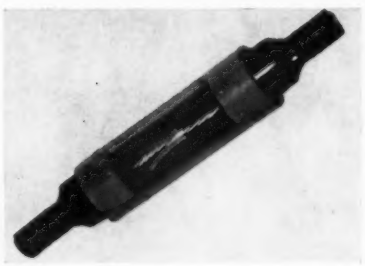
To make a splice you slip the mold pieces on the ends of the wire, pencil down the insulation, turn on the spring connector and pull the plastic mold units into place over the connection. Then you squeeze the plastic container to break the inner partition and release the hardener into the resin. Mix them by kneading the bag until the resin is uniformly colored. Then, snip off the end of the container and pour the resin mixture into the spouts. It hardens in 5 to 15 min, depending on the temperature. When it is hard, the spouts can be removed, but the mold itself is left in place for added protection. Backfilling can begin immediately.

It is pointed out that despite the high dielectric, excellent adhesion and resistance to moisture, offered by the epoxy resins, their use has generally been limited to controlled conditions. This new method is expected to find usage wherever critical applications or difficult conditions demand an easily-made splice offering maximum protection. Present applications are reported to include lighting and communications cable, and splices in insulated conductors above and underground and submerged. Minnesota Mining & Mfg. Co.



Spring connectors and plastic molds

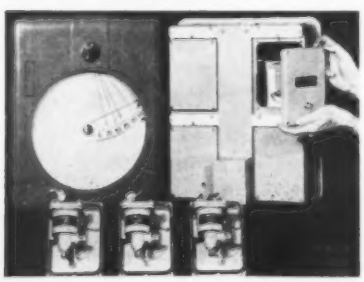
Plus the self-hardening epoxy resin



Equal this well-protected cable splice

2—RECORDER has plug-in receivers and automatic inking

A receiver recorder for pneumatic and electric transmission systems in power and process plants, this instrument is designed to record any measured variable which may be converted to pneumatic or electric signals. It keeps continuous, independent records of one to four pneumatic and electric transmissions in any combination. Plug-in pre-calibrated receivers make this possible.



The receiver units (shown in the foreground of the picture) may be plugged into the rear of the recorder casing (right) to form any combination of one to four records. These units may be added or interchanged for adaptation to new or revised metering and control application. Two plug-in escapement-type integrators may be included in the same casing with two flow records.

Fountain type recording pens provide continuous feed a year without refilling. They are fed from sealed ink sacs. The new recorder is designed for panel mounting, requiring a cutout only 14 by 17 in. Panel bolt holes and studs are not required. Recorders are available in green, buff, gray or black baked enamel finish. Bailey Meter Co.

More information on any of these products can be yours without cost or obligation. Just circle the item numbers on the Reader Service Cards provided on pages 215-216.

3—AUTOMATIC DRILL is self-contained, versatile

The Series 24 Automatic Drill is a self-contained unit which operates on low air volume. According to manufacturer, it is simple to set up, it requires only two outside connections, conventional shop air and electric power, and it can run on a small portable air compressor. A hydraulic control accessory, which controls the rate of feed, is available for drilling hard materials at special angles or on curved surfaces. It is explained that separation of hydraulic control from air

They serve the best who wait the longest

Here's one place where cobwebs would be strictly OK—on a piping maintenance man's tools. For the less they have to work, the lower your maintenance costs.

Excessive valve maintenance is serious simply because the average plant has so many valves. So it's sound economics and good business to buy quality and low maintenance rather than "bargains" and frequent maintenance.

Naturally, the thrifty buyer always chooses quality valves, and for biggest value he insists on Crane. There's no greater assurance of dependable, low-cost performance . . . and the Crane line provides such quality in valves for every need.

Crane Co., *General Offices:* 836 S. Michigan Ave., Chicago 5, Ill.
Branches and Wholesalers Serving All Industrial Areas.

CRANE

VALVES • FITTINGS • PIPE • PLUMBING • HEATING

For more facts circle 591 on Reply Card

NEW PRODUCTS

(Begins on page 164)

circuits facilitates repairs at the end of drilling cycles and lessens deterioration of parts.

The drill is 23½ in. long, including chuck, and weighs 88 lb including motor. It has 10 spindle speeds from 440 to 7400 rpm, is driven by a timing belt, and available in ½- or ⅓-hp motor with varying voltages. Chuck capacity ranges from No. 60 drill to ⅜ in. The unit can be converted to tapping, reaming, deburring, centering, counter boring, spot facing, counter sinking, hollow milling.

Manufacturer points out that the unit operates on resistance drilling or control feed, which lessens drill breakage and errors and enables less skilled operators to do the work. The Series 24 Drill is mounted by the nose bracket; it can be mounted in any combination—radial, vertical, opposed or angular—in standard brackets. Dumore Co.

4—TEFLON BELLOWS now have companion flanges

Chemically inert, corrosion and heat resistant bellows made from Teflon are now available with companion flanges conforming to American Standard bolt hole circles and numbers for pressures to 125 psi. They can be supplied to fit pipe from ½ through 12 in. The bellows feature a convulation form which is said to afford great strength, longer life and increased flexibility. It is pointed out that since they retain information at full free length, they are subjected to minimum residual and working strain. They expand and contract in either direction. Temperature range is —94 to 500 F.

The bellow flanges are of French-type gasket construction for good sealing at lower flange pressure, and gasket insert material is asbestos or synthetic rubber. Typical applications for these bellows include vibration dampeners, expansion joints and connectors. They come in designs suitable for metering pumps, pressure accumulators, batching systems. Crane Packing Co.

6—VINYL COATING, white, for paint spray booths

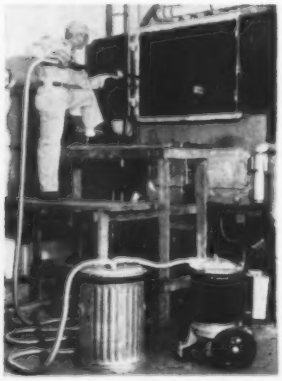
High light reflectivity and reduced booth maintenance, due to simplicity of application and removal, are among advantages announced for White Vincote, a white-pigmented vinyl coating for paint spray booths. You spray it on the wall surfaces and it dries almost at once to a tough, white film. When dried, it is a poor base for combustion, says manufacturer, and it permits paints, lacquer, and enamel overspray to be peeled off quickly. Also, its high light reflectivity aids the operator in obtaining a better finished product.

According to company, the pigment in White Vincoat remains in perfect mechanical dispersion indefinitely without stirring or agitating. It may be used "as is" without further thinning, manufacturer states, and its increased tensile strength eliminates possibility of the film breaking off the walls under normal dirt load conditions. A gallon covers 250 to 400 sq ft, depending on thickness desired. It is shipped in drums, kegs, and 5-gal containers. Detrex Corp.

7—MAGNETIC TOOL cleans metal out of tanks, baths

The Magic Clean-Out Tool uses a magnet for quick removal of ferrous metal deposits in dip tanks, plating tanks, hydraulic system oil reservoirs, acid baths and vapor ovens. The tool is made of a Neoprene covered Alnico V magnet attached to a 48-in. wooden handle with die-cast zinc clamps, coated with Hysol 3801-B, a solution used by the plating industry for coating racks and tanks. The Magic Clean-Out Tool is available with 20-, 30-, or 45-lb lift magnets. Standard Portable Cord Co., Inc.

5—FURNACE, BOILER CLEANER with powerful suction



Here's a furnace and boiler cleaner providing double suction with two fans powered by a ¾ hp motor. The fans are fully protected, says manufacturer—no damp soot can cake on them to unbalance them and injure the bearings. Vertical design and a double dust bag serve to separate the dirt before it gets to the fans, it is explained, and the extra dirt receptacle increases the dirt capacity by as much as six times.

The dust bag is enclosed in a metal tank and has a 1200 cu in. capacity. To empty the bag, you simply remove the cover from the metal tank and take out the double dust bag—the motor in the base of the tank is undisturbed. After being emptied, the bag is dropped back into the can and the cover replaced. A spark catcher collects hot coals and sharp scale. The motor operates on either a-c or d-c, in all cycles up to 60. The Kent Co., Inc.

8—AIR COMPRESSOR is packaged, heavy-duty unit

The Model PHE is a packaged air compressor in the 75-100 hp range designed to approach the efficiency and economy of larger, more powerful, slow speed compressors. Incorporating an opposed-cylinder, balanced design driven by a direct connected, induction motor, the compressor is arranged in single or multi-stages. The basic design is a two-stage unit for 80-125 psi, but other cylinder arrangements are available for higher pressures or for pumping vacuums. The Model PHE requires little floor space, a simple foundation and a minimum of piping and connections. Form 3155 gives details. Ingersoll-Rand Co.

9—WORK TRUCK has ladder and extension shelf

For high level maintenance jobs, this new work truck with safety ladder and "high altitude" extension shelf is made entirely of aluminum. It's light in weight, easy to push. When you step on this ladder, it slides through the guides until the rubber feet rest solidly on the floor, locking truck and ladder to the floor as a unit. Stepping down and off the ladder automatically releases it to its storage position.

The extension shelf at its top position is 8 ft above the floor; the top ladder step is at the 5½ ft level, giving the operator a reach potential of nearly 12 ft. The truck has three handy shelves to carry small repair parts, cleaning equipment, storage materials. Truck and ladder are said to roll freely through a standard 6 ft 8 in. doorway with the extension shelf down. Rol-Away Truck Mfg. Co., Inc.

10—WET DUST COLLECTOR of tower type construction

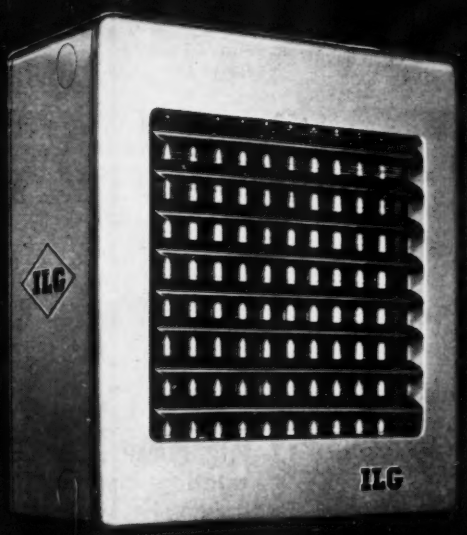
The Type CW-1 is a centrifugal wet dust collector designed for dust control problems which cannot be solved by cloth type collectors—including temperature or moisture; explosive or combustible dusts; corrosive, highly abrasive and/or obnoxious dusts; and combinations of these.

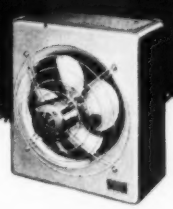
Of counter-current design (air flow counter current to water flow) and tower type construction, it consists of multiple wet vane sections and a final water entrainment vane section. The diameter of the collector varies in proportion to the air volume handled and the number of wet vane sections is governed by application requirements. The water supply enters above the top wet vane section and flows downward, or counter to the upward flowing air, which enters collectors through lower tangential inlet.

This design is claimed to provide greatly increased impingement surface and

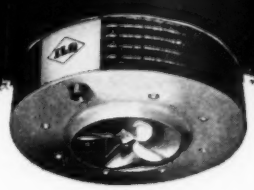
Announcing 3 completely new

ILG®

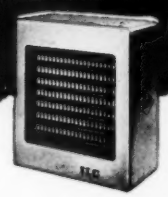




HORIZONTAL
Back view: ideally suited for the majority of installations.



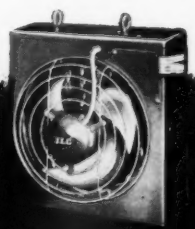
VERTICAL
For use in spaces with high ceilings.



TEXTILE
For installations where lint or dust might clog coil.

ILG®

Plants, stores and offices can all enjoy a warm, comfortable climate with the brand new, all new Ilg Steam Unit Heater. Look at the clean modern lines of the smart cabinet. See how they give hint of the advanced design and performance features you'll find within. Combine Ilg's rugged, precision construction with Ilg's outstanding engineering and you've got a unit unmatched in quietness, dependability and ease of installation . . . a unit that's by far your best buy in steam unit heaters. Available in 16 capacities, there's a model to fit every job. Write today for complete information!



ALL-ELECTRIC UNIT HEATERS

GAS UNIT HEATERS

ILG ELECTRIC VENTILATING CO.
2850 N. Pulaski Road, Chicago 41, Illinois

For more facts circle 592 on Reply Card

NEW PRODUCTS

(Begins on page 164)

impart vigorous centrifugal action to both air and water to produce thorough intermixing. Increased capacity is obtained in reduced space, says company, and channeling is prevented. Water and dust are discharged as sludge from the lower cone and clean air from the top outlet. After clarification in settling tanks, the water may be recirculated. Pangborn Corp.

11—SPEED REDUCERS simplify machinery application

Multi-Mount Reducers are designed to simplify application to all machinery or equipment combinations. Each type of reducer can be mounted, without modification, on floor, wall or ceiling, with shaft horizontal or vertical. Helical gear systems incorporated are said to make for efficiency, maximum resistance to wear and shock loads, long life and quiet operation.

Offset shafts make possible more compact designs, permit use of larger gear diameters and require fewer parts. The drive shaft with widely spaced bearings is located close to the mounting feet, therefore minimizes torsional stress on the mounting base. Multi-Mount Reducers are available in many types—with feet or footless, face or flange mounted and in a wide range of hp ratings and speeds. Bulletin 186 contains additional data. Sterling Electric Motors, Inc.

12—DIE PULLER can work in narrow aisle conditions

The 30-Degree Die Puller, shown mounted on the platform of company's PO-40 Hi-Lift Electric Truck, also handles other loads, like the tin plate pictured, and is available in capacities to 6000 lb. The platform of the truck is angled at 30 deg from the base structure of the truck, for use in narrow aisles. The truck can approach the press, or wherever the load is located from an angle, and function in places where many die pullers won't work.

Besides permitting one-man handling of heavy loads, this die puller is readily converted into a pusher by means of a bar which reverses the movement. Movements of truck and die puller are controlled by push buttons located in a movable control box, connected to the truck by a cable, and operation is completely automatic. Barrett-Cravens Co.

13—CONTROL CENTER features greater flexibility

Designed for flexibility, a new control center has a removable operator's panel in the door of each individual combination plug-in unit to accommodate up to four push buttons, selector switches, or pilot lights. This facilitates their removal,

since wires to pilot devices in the door need not be disconnected. Also, it's easy to install additional pilot devices.

Units are enclosed on all sides to localize damage in case of fault. Doors attached to the main structure, can be reclosed after the unit is removed. Vertical wiring channels and openings into plug-in units are designed so that wires can be laid easily in place, and a steel barrier separates horizontal wiring channel from bus bars. High short circuit strength is obtained by edge-to-edge mounting of horizontal bus bars and by use of strong tubular vertical bus. Section dimensions are 20 in. wide, 20 in. deep, and 90 in. high, with each section accommodating up to six combination starter plug-in units. Square D Co.

14—ALUMINUM PAINT for use on the hot surfaces

Hot Surface Aluminum SP-415 is an improved paint for metal surfaces subjected to heat up to 1000 F. It combines fine aluminum paste with a special vehicle, and is shipped in double compartment containers. Applied to surfaces while warm, it is said to take only two hours to dry; is adapted for use on boilers, pipes, heaters, ovens. One gallon covers about 500 sq ft. United Laboratories, Inc.

15—250-HP STEAM BOILER is only 9 ft 5 in. long

The MC 250 is claimed to be the smallest 250-hp firetube steam generator produced and to greatly increase power in small boiler rooms. It requires installation space of 9 ft 5 in. long, 6 ft wide, and 6 ft 8 in. high—about one-fifth the cubic space needed to install boilers of equal rated horsepower, it is noted.

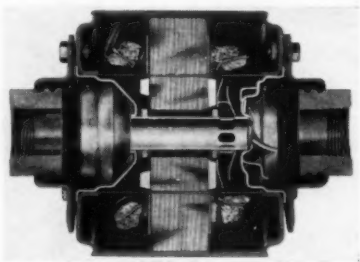
The MC 250 burns either oil or gas, or oil and gas; is designed for 15 to 200 psi pressure. It delivers a maximum of 7500 lb of steam per hr with normal operating capacity of 6250 lb per hr. It is equipped with a modulating unit that operates from 30 to 100 per cent of capacity, company points out, and all fuel is consumed in the combustion chamber. Cyclotherm Div., U. S. Radiator Corp.

16—SWIVEL COUPLINGS in eight different types

The All-Flex is a ball-bearing swivel pipe coupling made in eight different basic types for rotation in 1, 2 and 3 planes in high and low temperature applications at pressures to 15,000 psi, in pipe sizes from ⅜ in. through 12 in. Advantages announced for these couplings include machining to close tolerances, minimum torque for rotation, multiple metal backed packing, suitability for pressures or vacuum. More information is contained in Catalog 234L. H & N Mfg. Corp.

17—FHP PUMP is driven by rotating magnetic field

The Dynapump—a centrifugal pump driven by a rotating magnetic field instead of a drive shaft—is announced as a low cost, leak-proof motor and pump unit having no seal or stuffing box. According to manufacturer, this pump is



suitable for services involving high pressures as well as high vacuums; is corrosion resistant, requires no lubrication, and presents no alignment problems. There is claimed to be no contamination of fluids handled by this compact and lightweight pump, suggesting its application for food products as well as wide range of other materials.

Available in fhp sizes, the units are of stainless steel for pumping most fluids; other materials for special use are available. More information is in Bulletin P-354. The Fostoria Pressed Steel Corp.

18—PALLET TRUCK takes loads up to 4000 lb

The Warehouser RP-4 is an electric rider low lift pallet truck capable of handling loads to 4000 lb. Designed for operation in five- and six-ft aisles, it is short and lightweight for low floor capacities and elevators. The truck has a pallet fork lift of 4 in. and a lifting time of approximately 5 sec for full lift with full load. The over-all spread of the pallet forks are in standard widths of 25, 27, 30 and 36 in; fork lengths are avail-

"DO IT YOURSELF" MAINTENANCE TIPS
from the GOULD Plus-Performance Plan

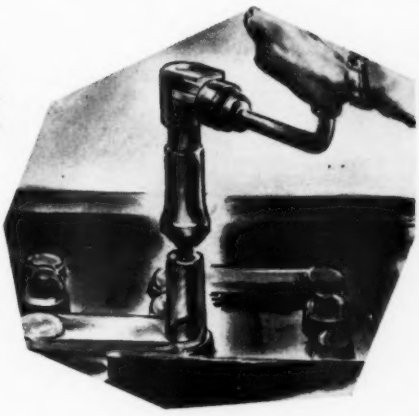
"AN EASY WAY TO CUT BATTERY-POWER COSTS"

HERE'S MONEY-SAVING MAINTENANCE TIP #1

Accidental damage in even the best regulated operations can put a cell out of commission. Here's a tip from the Gould Plus Performance Plan on how to easily remove and repair a cell.

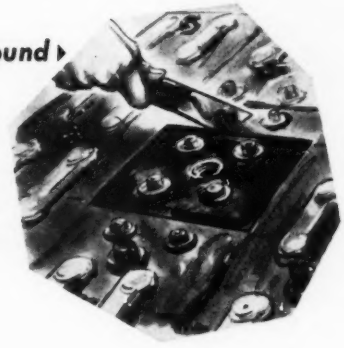
1. *Remove Connectors* ▸

We recommend using a special drill (Gould Part No. 35459C) which allows the cell post to remain by cutting the bond to the lead insert of the cover.



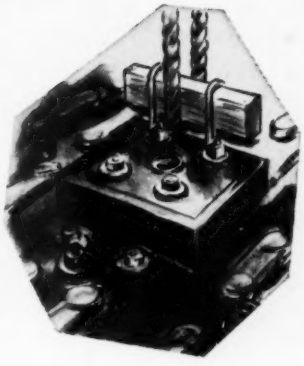
2. *Remove Compound* ▸

from between jar to be removed and adjacent cells. Use a warm compound knife for this purpose. Pour a little penetrating oil or kerosene mixed with regular oil into space between cells for lubricant.



3. *Pull the Cell* ▸

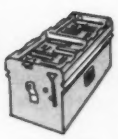
The best way is to screw a Gould Cell Puller (Part Number 77061) to the negative post remaining after drilling in No. 1. Then attach hoist and lift. If a cell has two negative posts, use two cell pullers, attaching the hoist to a piece of wood placed through the cell puller loops.



GOULD Batteries

GOULD-NATIONAL BATTERIES, INC.
TRENTON 7, N. J.

For Railroad Air Conditioning and Lighting


For Mine Shuttle Cars and Locomotives

For Electric Industrial Trucks

For Diesel Locomotive Starting

For Standby and Emergency Power

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Always Use Gould-National Automobile and Truck Batteries

This is only one example of the many helpful service tips contained in the Gould Plus-Performance Plan. For the complete set of published information on battery service and maintenance mail the coupon TODAY.

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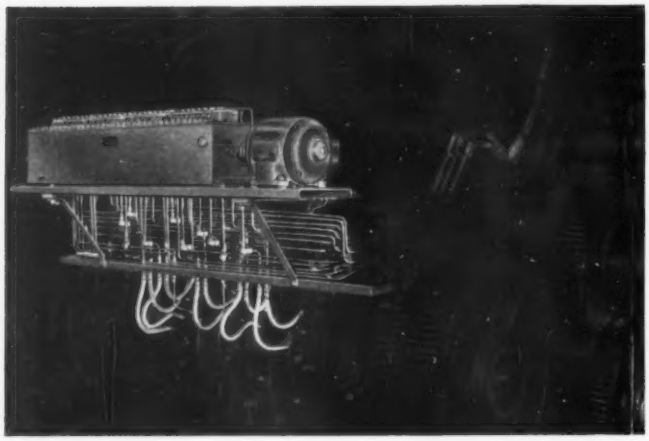
FORCE FEED LUBRICATORS COST LESS...

than doing without them!



Pressure Application — Exact Amounts — Accurately Timed

* Manzel Force Feed Lubricators quickly save their cost by preventing breakdowns due to faulty or forgotten lubrication — by reducing the quantity of lubricants used — and by eliminating the labor of hand oiling. They keep vital parts properly lubricated for uninterrupted production efficiency round the clock.

You can have Manzel Force Feed Lubricators installed on present equipment or engineered into new machinery. Write for information.

Manzel

DIVISION OF FRONTIER INDUSTRIES, Inc.
301 BABCOCK STREET, BUFFALO 10, NEW YORK

For more facts circle 594 on Reply Card

NEW PRODUCTS

(Begins on page 164)

able from 36 in. to 60 in. A two-position speed control lever located on the right hand side of the operator's compartment can be positioned for operator convenience in facing either direction of travel. It has three speeds forward and three speeds reverse with time delay controls between speeds to insure smooth acceleration. The Yale & Towne Mfg. Co.

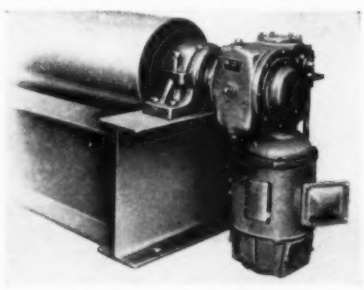
To receive product data circle item number on the handy Reader Service Cards provided on pages 215-216.

19—BOOSTER PUMP steps up the water pressure

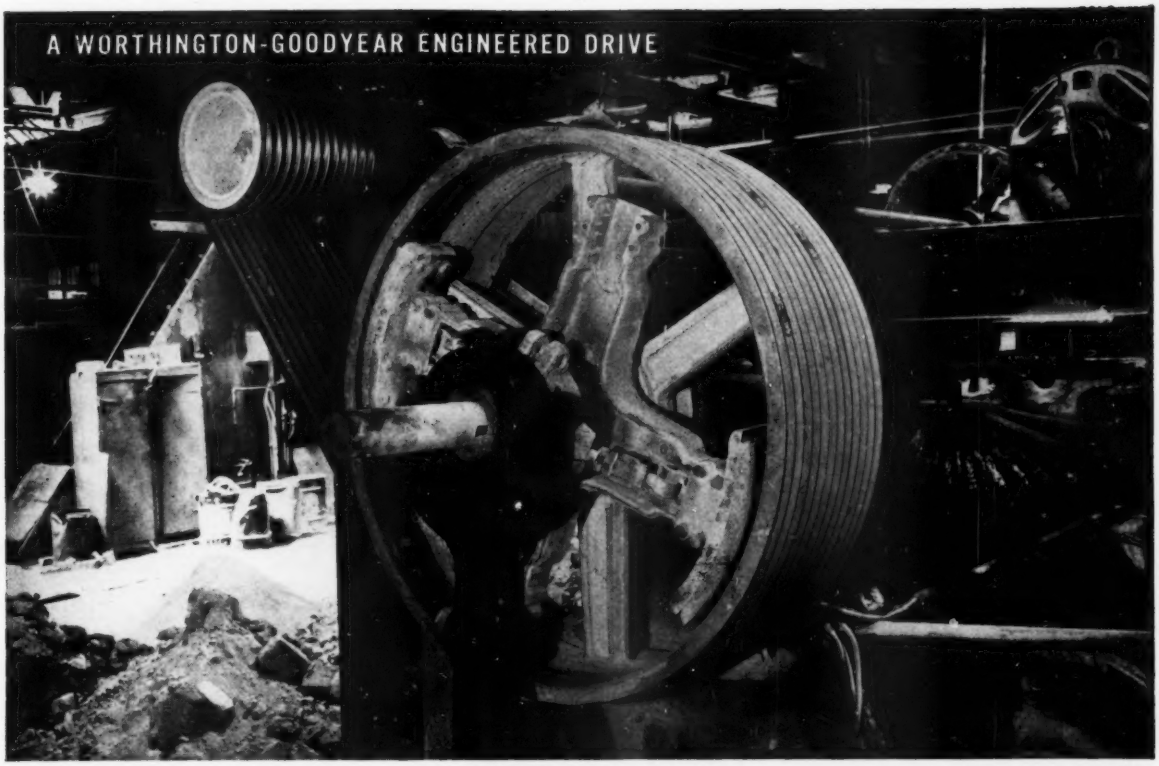
For use where pressures developed by existing water pumping stations are inadequate because of extended water mains and increased water demand this low cost pressure booster is offered. Available in many sizes the booster is a centrifugal pump of corrosion-resistant bronze construction. It is small and utilizes a specially constructed sleeve bearing motor for quiet operation. The pump can be installed directly in the lead-in pipe from the water main and is operated automatically by a switch which detects changes in water pressures. When the city water pressure drops below a minimum setting, the switch starts the pump. Models for capacities to 1200 gpm using motors up to 75 hp are available. Bell & Gossett Co.

20—GEARMOTOR is located where power is needed

The Floating GearMotoR is designed to reduce power transmission to its simplest terms. The compact gear unit and motor mount directly on the driven shaft. Since the power unit becomes an integral part of the driven shaft, misalignment between



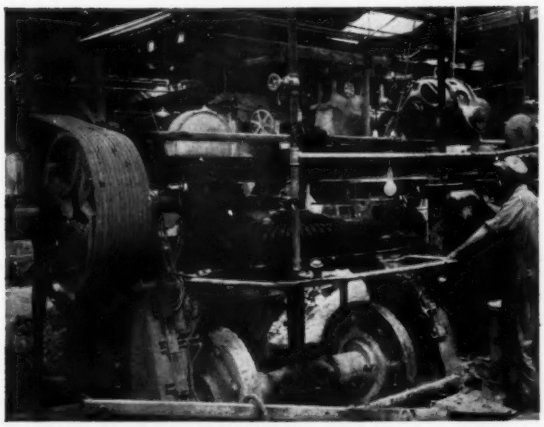
them is prevented, it is noted, and a simple torque arm prevents the gear unit from rotating. The Floating GearMotoR can be mounted in almost any location or position, and the right angle worm and worm gear arrangement lets the entire unit nestle close to the driven machine. Gearing is proportioned for 300 per cent peak loading over normal ratings. Hous-



WORTHINGTON MULTI-V-DRIVE takes heavy shock loads at R. C. Remmey & Son.

Belts hold as machine crushes 120-lb lumps

Worthington distributor solves critical drive problem for refractory



SMOOTH, NON-SLIP DRIVE for this wet-pan is provided by Worthington QD sheaves and Goodyear V-belts.

Driving a machine that crushes, mixes and tempers crude clay is a real workout for any mechanical power transmission setup — especially with lumps weighing as much as 120 pounds.

That's just what the R. C. Remmey & Son Company, Philadelphia manufacturers of refractories, ran up against in driving their 20-hp wet-pans.

About two years ago, R. C. Remmey & Son started looking for a replacement drive for one of these wet-pans. They contacted the nearest Worthington distributor who recommended Worthington QD* sheaves and Goodyear open-end V-belts.

Now, after two solid years of operation *not one belt has been replaced or tightened.* There's no noise, no slippage of belts on sheaves, and no power loss — which means maximum production. Because of this fine record, R. C. Remmey & Son is planning to install Worthington Multi-V-Drives on other wet-pan pulverizers.

Find out how this Worthington-Goodyear drive team can pay off for you, too. Write us. Worthington Corporation, Section MV.4.2, Oil City, Pa. **Reg. U.S. Pat. Off.*

MV.4.2

WORTHINGTON

BUY THESE WORTHINGTON STANDARD PRODUCTS FROM YOUR LOCAL DISTRIBUTOR

Compressors • Pumps • Multi-V-Drives • Variable Speed Drives

For more facts circle 595 on Reply Card

...Rugged, Efficient, Economical...
Pays for itself Quickly

For continuous and heavy duty service at constant capacity and efficiency, Norblo Automatic Bag Type Dust and Fume collection pays its own way—in the recovery of valuable materials or the removal of injurious or "nuisance" industrial air contaminants. Norblo builds the entire installation, from blowers to bag-cleaning mechanisms. Complete systems are engineered to meet specific situations, production layouts and required capacities. Norblo engineering insures low maintenance and no shut-downs—guarantees performance of every installation. Write for Bulletin 164-3.

Norblo also builds centrifugal and hydraulic dust collectors, exhaust fans, cement air cooling systems and portable dust collectors.

Cutaway shows Norblo basic unit of 78 bags. Automatic shaking and bag cleaning, one unit at a time, insures full use of cloth area better than 99% of the time.

The Northern Blower Company
Engineered Dust Collection Systems for All Industries
6423 Barberton Ave. Cleveland 2, Ohio

For more facts circle 596 on Reply Card

NEW PRODUCTS

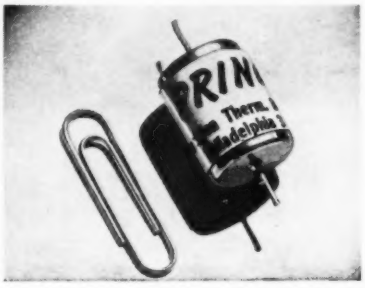
(Begins on page 164)

ing construction is cast steel or cast iron.

According to manufacturer, the Floating GearMotoR fulfills the needs for a roll or conveyor drive which is self-contained and located at the point where power is needed. It is a standardized high torque unit providing a range of output speeds from 8 to 800 rpm with integral electric motors ranging from 1 to 15 hp. It is announced as relatively low in initial cost and affords further savings in maintenance and downtime. More information is found in 8-pp Bulletin F-54. Philadelphia Gear Works.

21—ELECTRONIC DEVICE prolongs life of thermostats

Arcing, the main cause of contact failure in mercury-in-glass thermostats, is said to be eliminated by use of a tiny electronic device, the Princo Stat-Varistor. Arcing occurs when the thermostat circuit opens, and the magnetic energy stored in the



relay changes to surging electrical energy which unloads through the thermostat. It is claimed these voltage surges can be cut down to negligible proportions with the Stat-Varistor, which is constructed of a series of special selenium plates that are hermetically sealed in glass. A variable resistor, it operates by changing resistance as the voltage across it is changed.

Resistance is high at low voltage and drops off quickly as the voltage rises. Thus the surge of electrical energy is absorbed by the Stat-Varistor, protecting the contacts of the thermostat and giving it longer life. All new Princo Thermostats can be provided complete with Stat-Varistor, which is also available as a separate unit. Precision Thermometer & Instrument Co.

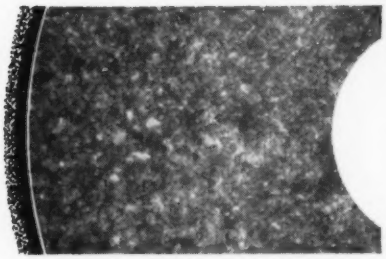
22—WALL SEALER for two-coat work on same day

Arcotone P.V.A. Interior Sealer is an interior wall sealer which permits two-coat work on the same day. A polyvinyl acetate type, it can be applied over damp (not wet) surfaces where the finish coat is to be a flat, porous type. Formulated for use on masonry, wood and wallboard surfaces, it is described as resistant to heat, fumes, moisture and alkali and requires no sanding. Other features announced include easy brushing, good sealing over asphalt, and ability to bridge

GRADUATED DENSITY

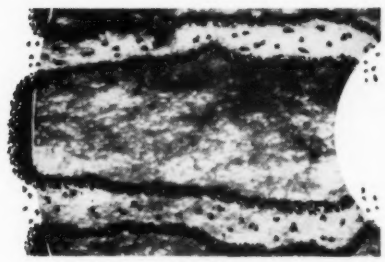
makes MICRO-KLEAN the most effective filter on the market!

How MICRO-KLEAN compares with other cartridge filters



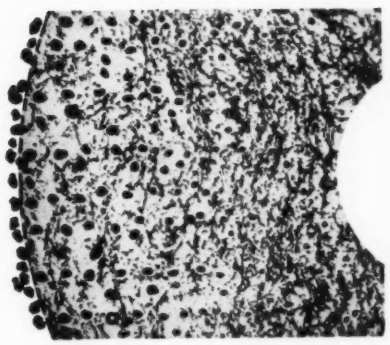
Compare **MICRO-KLEAN with**

FILTERS WITH THE SAME DENSITY THROUGHOUT. The filter media density is the same on the pressure and discharge surfaces of the element; therefore, dirt accumulation is largely on the outside surface, choking the cartridge ("plastering") and reducing the effective filter life.



Compare **MICRO-KLEAN with**

FILTERS WITH HAPHAZARD DISTRIBUTION OF FILTER MEDIA. Uneven haphazard media density permits fluid to find channels through the filter, and pass solids larger than the minimum filter spacing.



Now Look **at the advantages offered by MICRO-KLEAN.** See how the fibre density increases toward the discharge side of the MICRO-KLEAN filter cartridge? In effect, every Cuno MICRO-KLEAN cartridge is an infinite multiplicity of screens, ranging from relatively coarse on the outside down to 10 microns in the center. Because of MICRO-KLEAN's graduated density in depth, particles are entrapped within the entire depth of the filter element, giving the cartridge a much longer effective life. Standard cartridge size is 9¾" long by 2¾" O. D., in densities of 10, 25 and 50 microns.

MICRO-KLEAN gives you

- **greater dirt holding capacity**
- **absolute protection against rupturing or channeling of the cartridge**
- **longer effective cartridge life**

REMEMBER . . . IF YOU CAN PUMP IT, CUNO CAN FILTER IT

M.3.C

CUNO

ENGINEERED FILTRATION

Removes More Sizes of Solids From More Kinds of Fluids

AUTO-KLEAN (disc-type) • MICRO-KLEAN (fibre cartridge) • FLO-KLEAN (wire-wound)

For more facts circle 597 on Reply Card

COMPACT, FULL-FLOW FILTRATION FOR INDUSTRIAL FLUIDS

Fewer Cartridge Changes Necessary with MICRO-KLEAN filters

You don't need a complicated, bulky filter to keep contaminants out of your chemicals, water, lube or fuel oils. Cuno MICRO-KLEAN's compact construction gives you full-flow filtration in space which would limit ordinary filters to by-pass service.

The high porosity and low pressure drop operation of MICRO-KLEAN filters permit this full-flow service on gravity, low pressure, or suction lines—with no loss in operating efficiency.

Cartridge replacement costs are generally cut in half when MICRO-KLEANS are used. MICRO-KLEAN's graduated density-in-depth provides much greater capacity for dirt accumulation within the micronic cartridge, giving twice the useful life of an ordinary filter element.

Cuno's exclusive method of felting fibres produces a cartridge of great structural strength, free from channeling or distortion and entirely unaffected by moisture or acids. And changing cartridges can be accomplished in a few seconds—only one nut has to be removed.

Send for Cuno's free filtration analysis form, have one of your engineers fill it out, and mail it to us. We'll let you know exactly what you need for your filtration requirements—without obligation. And take advantage of Cuno's unique "money-back" offer. If MICRO-KLEAN doesn't outperform any filter cartridge you have previously used, we'll send you *double* your money back. Send the coupon today for free MICRO-KLEAN bulletin. M.3.5

Cuno Engineering Corporation
Dept. 275C South Vine Street, Meriden, Conn.

I'm interested in your "money-back" offer. Please send me your filtration analysis form—and more information on MICRO-KLEAN for

..... (fluid)

Name.....

Company.....

Address.....

City.....Zone....State.....

Now you can have the advantages of USCOLITE* in your valves as well as in your piping

*Uscolite is a registered trade mark of United States Rubber Company.

Developed to supplement Uscolite* pipe and fittings, the new Uscolite bodied Hills-McCanna Diaphragm valve, now makes it possible to utilize Uscolite's advantages throughout your piping layout. The unique Saunders patent design of the valve coupled with the chemical resistance of Uscolite makes the valve ideal for plating, water treatment, and in the manufacture of fertilizer, bleach, storage batteries, pulp and paper, etc.

The Hills-McCanna Uscolite bodied valve is available in standard sizes from ½" through 2". It is suitable for pressures to 150 psi and for temperatures to 170° F. (at some sacrifice of pressure rating in larger sizes).

Write for details. HILLS-McCANNA CO. 2450 W. Nelson St., Chicago 18, Ill.

DESIGN DETAILS

- Working parts isolated from flow.
- No packing.
- Leaktight under pressure or vacuum.
- Simple pinch clamp closure principle.
- Minimum maintenance even in the severest service.

HILLS-McCANNA

saunders patent diaphragm valves

Also manufacturers of
Chemical Proportioning Pumps • Force-Feed Lubricators
Magnesium Alloy Sand Castings

For more facts circle 600 on Reply Card

NEW PRODUCTS

(Begins on page 164)

hairline cracks and cover minor surface defects. Company says it will not raise the fibers when used on plaster or gypsum boards. The sealer dries to touch in 2 to 4 hr, may be recoated after 4 hr.

Coverage ranges from 300 to 400 sq ft, depending on surface. The Arco Co.

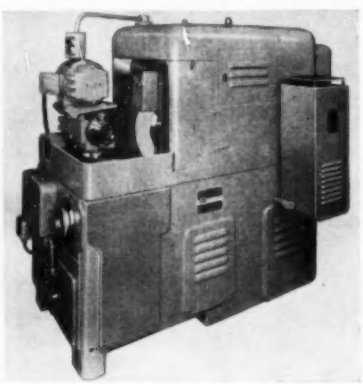
23—CHAIN HOISTS for handling loads to 25 tons

A new addition to this company's line of Safeway hoists is a streamlined, all-purpose chain hoist for loads up to 25 tons, to be produced in 11 different capacity models. Manufacturer says sealed construction makes it suitable for use under practically all atmospheric and operating conditions, and assures longer service life.

The hoist may be used in cement mills and foundries operating under excessively dusty conditions, heat treating rooms, and industries with cold or wet exposures. Company says it needs no attention other than replenishing of oil in the wick oiler. A non-fouling guide is provided to prevent gagging of the hand chain and permit its use from any angle. The 5- to 10-ton models have six pocket sheaves; 12- to 25-ton models, ten pocket sheaves, which are carried in and shrouded by steel castings. Wright Hoist Div., American Chain & Cable Co., Inc.

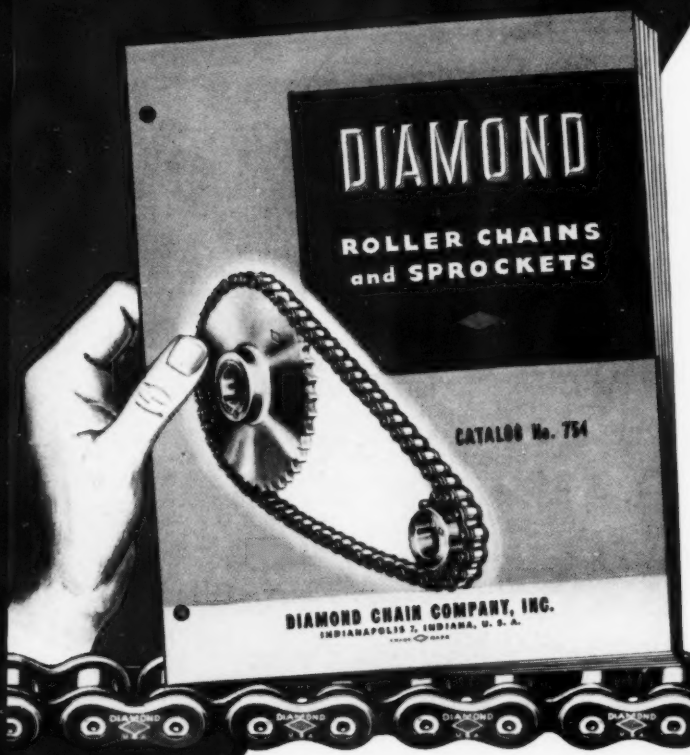
24—PLUNGE FORM GRINDER affords simple set-ups

The Model E Automatic Plunge Form Grinder is compact (only 44 in. by 78¼ in.), affords great accessibility and simple set-ups, and is said to offer extreme accuracy and high production. It can be used for chucking work, center



work or shoe type grinding, crush wheel or diamond trueing, with automatic or manual handling.

It has a completely automatic cycle, manufacturer points out. High speed approach, wheel feed, sparkout and withdrawal are controlled through simple cam action, making for constant, uniform operation under all conditions. The wheel slide is held against a positive stop with uniform hydraulic pressure for automatic



Here's the Very Latest on Roller Chains 64 Pages of Important Data and Information

DIAMOND *Stock* ROLLER CHAINS AND SPROCKETS

● In this new complete catalog are data and information compiled by our engineering department—information based on 65 years of experience in the production and application of Roller Chains and Sprockets for power drives, secondary drives, timing, lifting, conveying, coordination of several machinery functions, etc.

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Here is a compact source of information and data on stock Roller Chains and Sprockets. Engineers and production men will find this comprehensive 64-page Catalog 754 is a time-saver in selection and correct application. Write today, or mail the coupon for a copy.

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- ✓ Selecting a STOCK Roller Chain Drive
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- ✓ Installation Recommendations
- ✓ Table of Speed Ratios for Sprocket Combinations
- ✓ Single and Multiple Strand Chain Weights, Tensile Strengths, and Prices
- ✓ Sprockets for Reboring, Stock Finished-Bore and Taper-Bushed Sprockets.
- ✓ Tables for Easy Sprocket Selection, Chains of All Pitches
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- ✓ Flexible Shaft Coupling Selection
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5 reasons for using DAY "AC" (HERSEY TYPE) DUST FILTERS for efficient dust control

DAY Dust Filters are doing an outstanding job in a wide variety of applications. Here are five reasons why so many manufacturers use (and reorder) DAY Dust Filters.

1. **Constant resistance resulting in constant air volumes.**
2. **High pressure reverse jet cleaning of filter tubes gives high air-to-cloth ratio.**
3. **Self-adjusting blow rings assure perfect tube cleaning, giving maximum air volumes at lowest pressures.**
4. **No shut-down to clean. Constant, automatic operation.**
5. **Installation requires minimum space.**

DAY service includes surveying your dust problem, engineering a practical solution, manufacturing required equipment including Exhausters, Cyclonic Separators, Filters, Piping, Fittings, and Hoods required to complete the system. ONE UNDIVIDED RESPONSIBILITY.
If you have a dust control problem, whether it involves a complete dust control system or a single unit, your inquiry is invited. WRITE FOR BULLETIN 528-R.

DAY "AC" Dust Filter installation, Lapp Insulator Company, LeRoy, New York. The company reports —"most of our dust is very fine and varies in size from 1 micron to 25 microns. The DAY Dust Filter solved our dust problem".

DAY SINCE 1881 DUST CONTROL
A SINGLE UNIT OR A COMPLETE SYSTEM

The **DAY** *Company*
807 Third Ave. N. E. • Minneapolis 13, Minn.
IN CANADA: P.O. Box 70G, Ft. William, Ontario
Branch Plants: Buffalo, Ft. Worth and Toronto, Ontario
Representatives in Principal Cities

For more facts circle 601 on Reply Card

NEW PRODUCTS

(Begins on page 164)

size control. Automatic trueing provides controlled dressing, once per piece or once per any predetermined number of pieces. Maximum diameter of swing over table is 13 in.; maximum length between centers, either 7½ in. or up to 32 in. Jones & Lamson Machine Co.

25—RIGHT ANGLE DRILL has three separate speeds

With the Tri-Speed Right Angle Drill you can drill holes in hard to reach places. Available in eight basic models, this compact portable tool is ball bearing equipped throughout and provides a wide range of usable speeds and torque. With three chuck speeds for each model, you can select within the tool range the

speed and torque most applicable for the job. Speed ranges, depending on the tool, are from 100 to 3000 rpm.

Basically, this is a straight electric drill driven by a ⅓ hp motor. To this drill is added the right angle drive which provides two extra chuck speeds in addition to the drill's regular spindle speed. and allows the drill end to be swiveled and locked in any position within 360 deg. Manufacturer says you get plenty of power for drilling holes up to 3 in. diam in wood and a triple gear reduction is used in the unit providing torque needed for tough drilling. Bulletin RAD-5 gives details. Milwaukee Tool Corp.

26—CLEANER for hand cleaning jobs in food plants

Formulated especially for hand cleaning operations in bottling, canning, meat packing and other food processing plants, General Cleaner is a free-flowing powdered detergent that dissolves readily in water. It produces long lasting suds that remain stable even when the solution becomes contaminated with fats and solid soils, says manufacturer; it has efficient water softening and wetting out properties, and possesses ingredients that emulsify fats, dissolve minerals present in many oils, and disperse others.

For hand cleaning manufacturer recommends concentrations of 1/5 to ¼ oz per gallon at temperatures from 110 to 140 F. The material is also said to be effective in spray or soak tank use, in concentrations of ¼ and ½ oz per gallon, at 140 F or higher. It rinses in hot or cold water. Used as recommended, General Cleaner

CONTINENTAL
Automatic Boiler

Manufactured by:
BOILER ENGINEERING & SUPPLY CO., INC.
Phoenixville, Pa.

- Two-pass design — simple and practical. Range 20 to 500 hp; 15 to 200 lbs. W.P.
- Factory tested before shipment. Guaranteed 80% efficiency.
- Spinning gas technique provides maximum radiant heat transfer from flame to water-cooled furnace walls.
- Even heat transfer — uniform flow of hot combustion gases through all return tubes. All tubes do the same amount of work, are subjected to the same temperatures, expand uniformly.
- Free and rapid water circulation keeps all heating surfaces clean; improves transfer of heat to boiler water.
- High CO_2 and low stack temperature — guaranteed not to exceed 125°F. above saturated steam temperature at operating pressure.

Write for Catalogs BE-3, BE-4

Check these points when you select a boiler:

(1) Fiberglas insulation with metal jacket and metallic paint finish.

(2) Lift lugs for convenient handling on job site.

(3) Boiler shell made of flange quality steel. All joints electrically welded. High pressure shells X-rayed to insure flawless construction and long life.

(4) Separator to assure dry steam supply (99%+).

(5) Dual low water cut-out to provide double insurance against dry firing.

(6) Practical front-end construction that provides open flow of combustion gases to stack. No refractories to maintain. Entire burner front hinged, providing easy access to fire tubes.

(7) Burner enclosed in furnace extension.

(8) Burner and its vital parts — such as fuel nozzles, flame scanner and ignition assembly — fully enclosed in steel housing for safe operation.

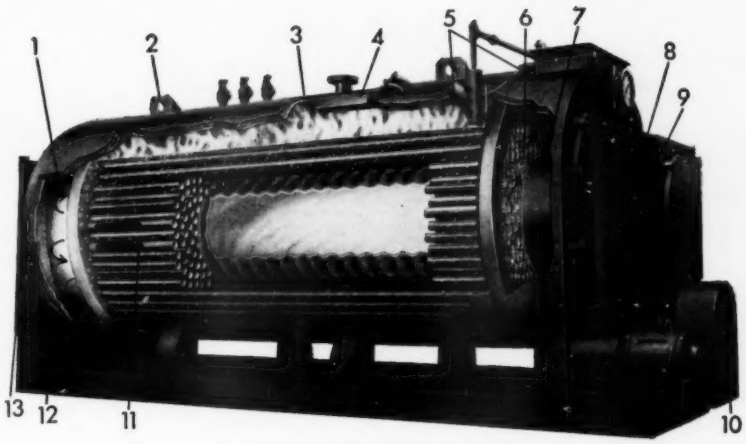
(9) Dual air-flow burner — for oil or gas fuels — precisely fitted to mix fuel and air for high combustion efficiency. Heat transferred directly to water surrounding the furnace.

(10) Air for the burner passes through an inlet silencer to a forced draft fan. Air flow controlled by adjustable dampers.

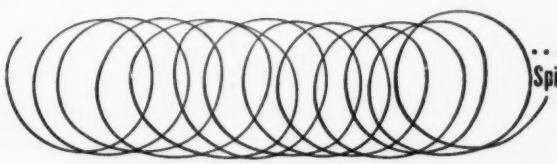
(11) Stationary alloy steel impeller in each return tube to impart spinning motion to hot gases.

(12) Structural steel base distributes weight evenly on boiler room floor. No special foundation required.

(13) Hinged rear door is lined with insulating refractory. Door can be opened in a few minutes — affording access to furnace and all return tubes. No need to remove and replace refractory baffles or brick work. Note sturdy hinge construction which insures positive seating of door.

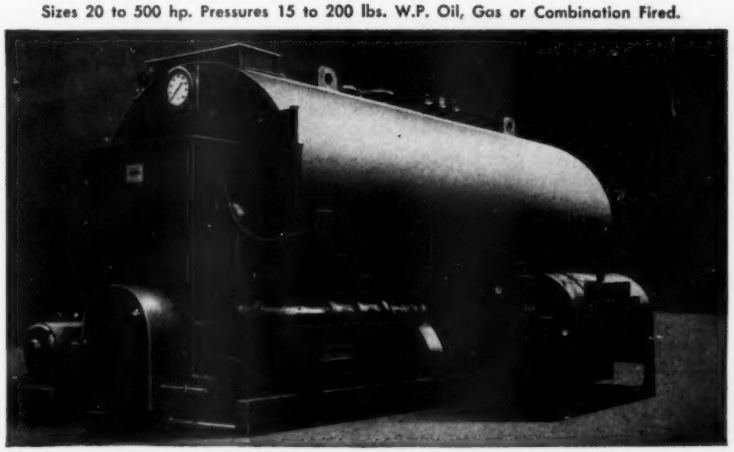


The CONTINENTAL Automatic Boiler



. . . the boiler with the Spinning Gas Technique

Sizes 20 to 500 hp. Pressures 15 to 200 lbs. W.P. Oil, Gas or Combination Fired.



For more facts circle 602 on Reply Card

NOW!
a new color for Gaco N-700 Neoprene Maintenance Coating

Available for the first time in

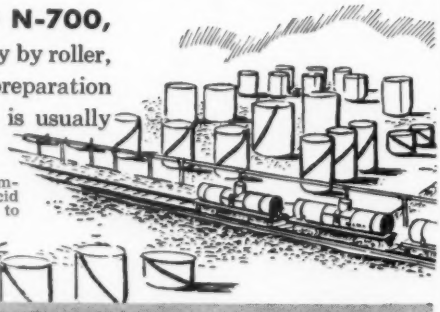
ALUMINUM
N-700 Neoprene Maintenance Coating

GACO NEOPRENE PROTECTION PLUS—GACO N-700, Aluminum, gives all the performance-proven corrosion protection found in GACO N-700, Gray and Slate Black, *PLUS* the advantages of the aluminum color—light and heat reflection and beauty.

TIME TESTED—GACO N-700, Aluminum, has been field tested for over 100 weeks in severe corrosive fume conditions, and passed with flying colors. It retained its beauty, brilliance and corrosion protection qualities.

REFLECTS LIGHT & HEAT—GACO N-700, Aluminum, adds the light and heat reflecting qualities of aluminum to the long-lasting corrosion protection of genuine GACO Liquid Neoprene.

EASY TO APPLY—GACO N-700, Aluminum, is easy to apply by roller, brush or spray. Surface preparation is simple—wire brushing is usually all that is necessary.



GACO N-700, ALUMINUM, is not recommended for service in presence of acid halides because these agents cause it to discolor. GACO N-700 *gray* or *black* should be used instead.

Send me complete practical and technical data on this genuine Neoprene Maintenance Coating that goes on like paint at lower applied cost. P

NAME_____

COMPANY_____

ADDRESS_____

Send this coupon to:

GATES ENGINEERING COMPANY 100 S. West St., Wilmington, Delaware

The pioneer maker of Neoprene coatings and linings

For more facts circle 603 on Reply Card

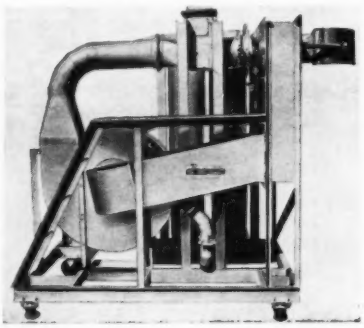
NEW PRODUCTS

(Begins on page 164)

is claimed to be easy on the hands and safe on stainless steel, copper, tin, aluminum and glass-lined surfaces. A service report gives data. Oakite Products, Inc.

27—CAR LOADER does the job within 2 to 4 hours

This portable pneumatic car loader, for loading bulk material into boxcars, travels on casters and can be used to load at many stations. The loader is easily raised off the caster and set down to desired position. Fed from overhead screw conveyor through rotary valves, it will load an 80,000-lb boxcar in two to four hours, company points out.



The loader is equipped with two filter tubes and eliminates dusting by putting a slight negative pressure on the car, it is explained. The fan handles more air than is blown into the car, bleeding off a small percentage which goes into the filter tubes. When the run is completed, the opening of a valve cleans out the dust accumulated in the bottom of the filter and puts it into the car. The Day Co.

28—DEMINERALIZER delivers water under pressure

To meet the need for a cartridge type demineralizer that will deliver demineralized water under pressure so that it can be piped to any desired point, used in pilot plant operations, as feedwater to other devices etc., the Model BD-2 Pressure Bantam Demineralizer is offered. A compact for direct connection into any water line, it is non-regenerative—it uses a replaceable resin cartridge like the one in company's non-pressure model.

It delivers demineralized water in continuous flow under pressure from 5 to 25 gal per hour. No heat or cooling water are required, says manufacturer, and the only operating attention needed is changing of the cartridge when indicated. Barnstead Still & Sterilizer Co.

29—MOLDED INSULATION now in more pipe sizes

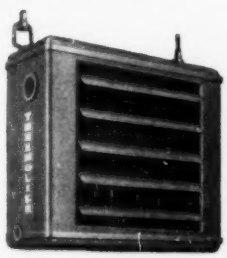
Hot and cold piping from ¾ to 24 in. in diameter can now be covered with G-B Snap On Pipe Insulation. A one-piece molded pipe insulation of fine glass fibers, this product was introduced last

HEAT

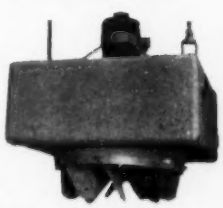
where you want it
when you want it
whatever the fuel you use

GRINNELL UNIT HEATERS

Horizontal Gas-Fired Model for natural, manufactured, mixed and LP Gases.



Horizontal Model for steam and hot water systems.



Vertical Model for steam and hot water systems.

Grinnell quality is well known. The "Grinnell" name is backed by over 60 years of heating experience. Regardless of the type and model you choose, you can depend on a Grinnell Unit Heater to give balanced heating performance plus maximum fuel economy. Call on Grinnell . . . for the unit heater to meet your specific needs.

GRINNELL
Gas-Fired Unit Heater

Available in 7 sizes — ranging from 25,000 to 200,000 Btu per hour input

Grinnell Gas-Fired Unit Heaters are easy to install, simple to operate and maintain. Efficient performance is assured — with any type of gas — by modern design of burners and heat exchanger, proper motor and fan unit. Automatic safety pilot operates to shut off main gas supply if pilot goes out. Flashback and extinction noise prevented by the burners' raised port design and proper port size for the gas used. American Gas Association approved.

GRINNELL THERMOLIER
Steam/Hot Water Unit Heater

4 models . . . 18 sizes — from 35,600 to 275,300 total heat delivered, Btu per hour

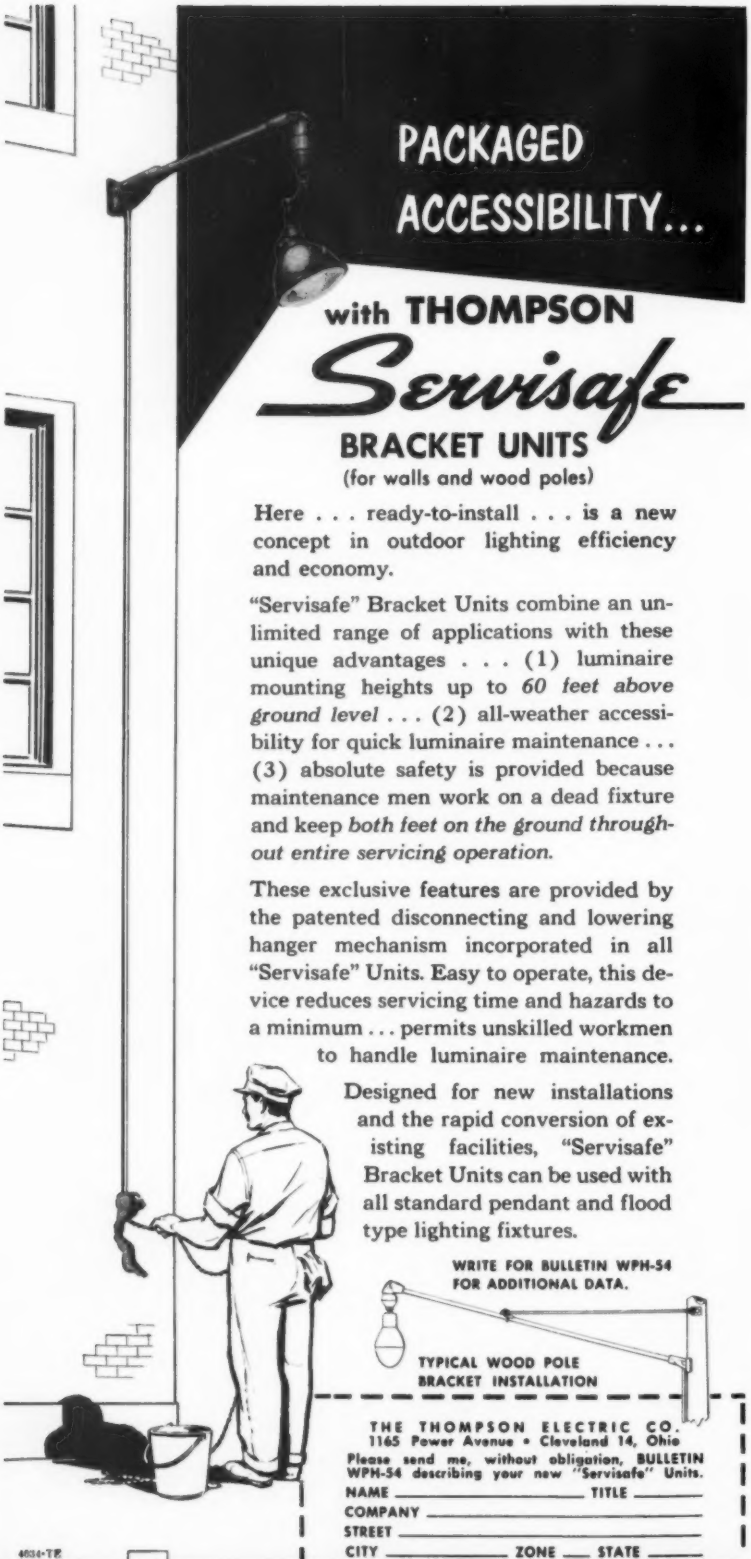
Three basic models—horizontal, vertical and a special horizontal Textile model. (Adjustable velocity nozzle also available for use on horizontal models.) All models have plain thermostatic trap, the simplest and least expensive kind of a trap, made practical because of unit's exclusive internal cooling leg; maximum capacity provided and destructive water hammer eliminated by built-in pitch of tubes. Many other important features.

GRINNELL
WHENEVER PIPING IS INVOLVED

Grinnell Company, Inc., Providence, Rhode Island • Coast-to-Coast Network of Branch Warehouses and Distributors

pipe and tube fittings • welding fittings • engineered pipe hangers and supports • Thermolier unit heaters • valves
Grinnell-Saunders diaphragm valves • pipe • prefabricated piping • plumbing and heating specialties • water works supplies
industrial supplies • Grinnell automatic sprinkler fire protection systems • Amco air conditioning systems

For more facts circle 604 on Reply Card


PACKAGED
ACCESSIBILITY...
with THOMPSON
Servisafe
BRACKET UNITS
(for walls and wood poles)
Here . . . ready-to-install . . . is a new concept in outdoor lighting efficiency and economy.
"Servisafe" Bracket Units combine an unlimited range of applications with these unique advantages . . . (1) luminaire mounting heights up to 60 feet above ground level . . . (2) all-weather accessibility for quick luminaire maintenance . . . (3) absolute safety is provided because maintenance men work on a dead fixture and keep both feet on the ground throughout entire servicing operation.
These exclusive features are provided by the patented disconnecting and lowering hanger mechanism incorporated in all "Servisafe" Units. Easy to operate, this device reduces servicing time and hazards to a minimum . . . permits unskilled workmen to handle luminaire maintenance.
Designed for new installations and the rapid conversion of existing facilities, "Servisafe" Bracket Units can be used with all standard pendant and flood type lighting fixtures.
WRITE FOR BULLETIN WPH-54 FOR ADDITIONAL DATA.
TYPICAL WOOD POLE BRACKET INSTALLATION
THE THOMPSON ELECTRIC CO.
1165 Power Avenue • Cleveland 14, Ohio
Please send me, without obligation, BULLETIN WPH-54 describing your new "Servisafe" Units.
NAME _____ TITLE _____
COMPANY _____
STREET _____
CITY _____ ZONE ___ STATE _____
THE THOMPSON ELECTRIC CO.
1165 POWER AVENUE • CLEVELAND 14, OHIO
For more facts circle 605 on Reply Card

NEW PRODUCTS

(Begins on page 164)

year in a limited number of sizes. It is intended for insulating chilled and refrigerated lines and heated lines where temperatures do not exceed 350 F. Because it nests with other insulations, it is also used as a second layer on high temperature lines. It is now made available in 3- and 6-ft lengths, depending on pipe size — pipe sizes up to 2 in. will be in 3-ft lengths. Wall thicknesses of ½, ¾, 1 and 1½ in. are available in sizes to 12-in. pipe size; and thicknesses of 1, 1½ and 3 in. for piping above 12-in. diam.

It is pointed out that for any insulating job, G-B Snap On costs no more than other pipe insulating materials, and it offers worthwhile savings in application costs. The user simply spreads it open at the single seam and snaps it over the pipe. The seam is joined with staples or other means, and the material painted, left "as is" or finished as desired. This lightweight insulation is also available with vapor-barrier for cold piping and with a weatherproof roofing paper for outside lines. Gustin-Bacon Mfg. Co.

30—INDUSTRIAL TV SYSTEM offers improved reception

The "UtiliVue" Closed Circuit Television System is announced as including many features which contribute to picture quality and operating stability. The Series 400 UtiliVue Camera utilized can be used either with a video monitor or with a standard TV receiver . . . can be tuned

to any channel from 2 to 6. Controls and power supply are built into this camera. Voltage regulation is built in, and the camera has automatic illumination compensation. The Series 400 can be provided with a Utilicon (long life cold cathode) or with a Vidicon type pickup tube. Multiple receiving points can be fed. Diamond Power Specialty Corp.

31—FORK TRUCK, electric powered, 5000-lb capacity

Model F-30T5, a 5,000 lb capacity, electric powered fork truck, features contactor controls, worm drive, caster trail axle, packaged unit assemblies and a rocker arm tilt. It has front wheel drive, rear wheel steer, tilting telescoping mast and center control. Speeds are as follows: travel, with full load, 5½ mph; without load, 6 mph; lifting, with full load, 25 fpm, without load, 42 fpm; lowering,

Manual to Mechanized

Saves $50,000 a Year

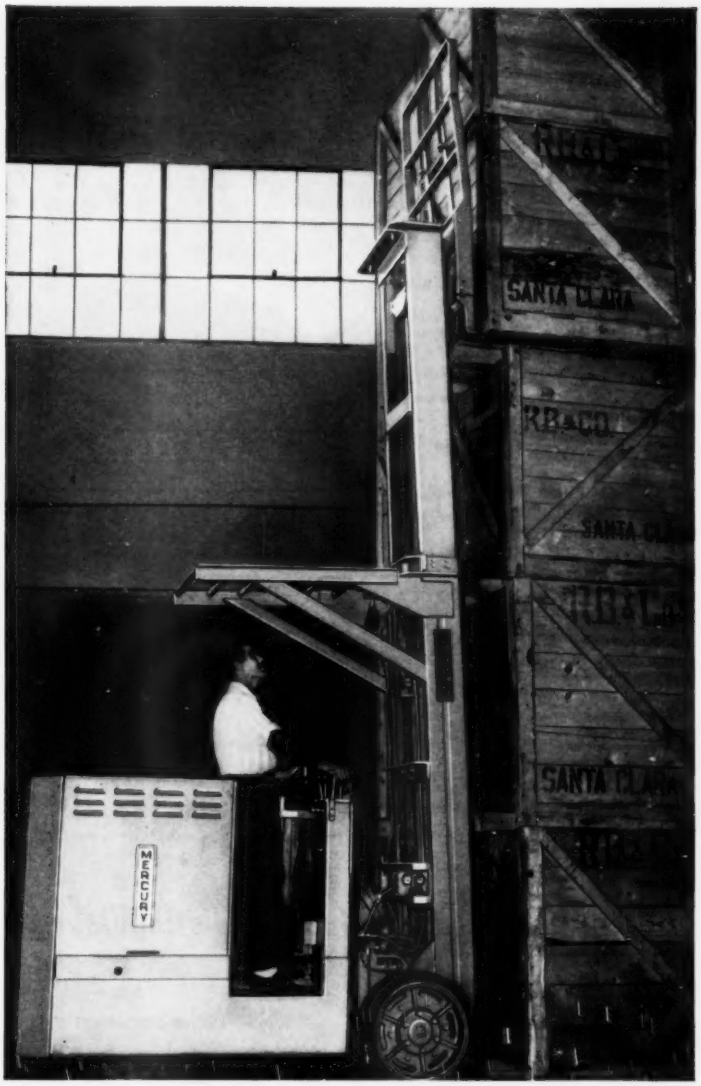
By mechanizing its material handling system, Rosenberg Bros. and Co., Santa Clara, Cal., has speeded and simplified dried fruit handling, achieved fuller use of its in-plant air-rights, and improved plant housekeeping.

The new handling system is built around portable open top storage bins and Mercury electric fork trucks equipped with special roto-lift attachments.

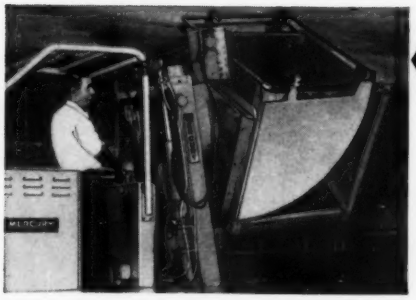
This completely mechanized handling system results in a minimum annual savings of over $50,000.

The 180° right or left rotation of the roto-lift carriage attached to the Mercury "Yak," allows the truck operator to lift a loaded bin over the hoppers, center it exactly over a hopper partition, and dump it into the processing channel.

Find out how MERCURY can effect important savings for your company. Write or wire today!

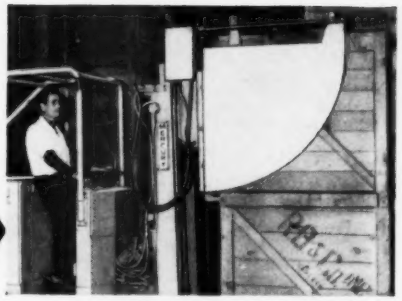


Mercury Fork Trucks with special Roto-Lift attachments speed and simplify handling



Mercury "YAK" fork truck with roto-lift attachment empties load into hoppers. These special attachments permit the use of 4' x 4' x 4' open-top wooden bins, eliminating use of bulky fabric bags and manual handling operations.

Here the operator picks up a bin before transporting it to processing area. Formerly, products were shoveled into wheelbarrels, wheeled to processing area and dumped into hopper. In addition to eliminating manual handling operation, plant housekeeping is considerably improved.



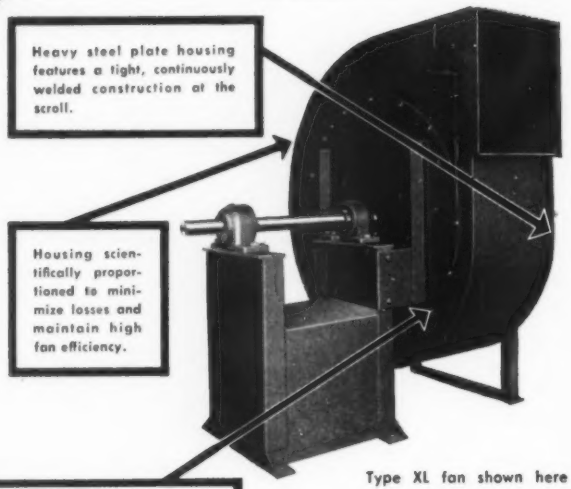
MERCURY MANUFACTURING COMPANY
4002 S. Halsted St., Chicago 9, Illinois

MERCURY
FORK TRUCKS · TRACTORS · TRAILERS

World's largest builder of industrial haulage equipment and originator of the "Trackless Train"

For more facts circle 606 on Reply Card

New . . . Clarage TYPE XL Industrial Fans


Heavy steel plate housing features a tight, continuously welded construction at the scroll.
Housing scientifically proportioned to minimize losses and maintain high fan efficiency.
Adjustable to any of eight standard discharges by merely removing tap bolts on each side and rotating the housing between the sideplates.

Type XL fan shown here is typical of the smaller sizes which provide universal discharge. Larger sizes are of reinforced sheet steel and base angle construction extending to the foundation line.

Exceptional Fan Equipment distinguished by:

1. High efficiency characteristic.
2. Rugged, tight construction.
3. Three interchangeable wheels — each with radial blades.
4. Large size range — 11" through 60" inlet diameters.
5. Pressures to 18" SP; volumes to 130,000 CFM.

Send for Bulletin 702 today . . .

A new, modern design offering many distinct advantages!

Clarage Type XL industrial fans are particularly well suited for diversified air and material handling applications. You'll profit from the high efficiency, in-the-field adaptability, and numerous other features of this exceptional fan equipment.

Learn more about these distinguishing features by requesting Bulletin 702, or contacting the nearest Clarage application engineering office.

CLARAGE FAN COMPANY
Kalamazoo, Mich.

You can Rely on...
CLARAGE
Headquarters for Air Handling and Conditioning Equipment
SALES ENGINEERING OFFICES IN ALL PRINCIPAL CITIES • IN CANADA—Canada Fans Ltd., 4285 [illegible], Montreal

For more facts circle 607 on Reply Card

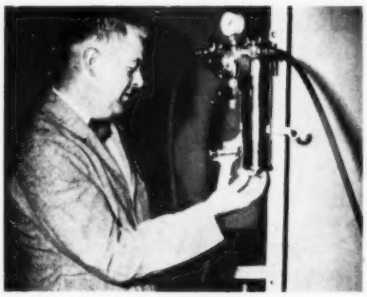
NEW PRODUCTS

(Begins on page 164)

with full load, 45 fpm, without load, 36 fpm. The hoist and tilt mechanism is hydraulically operated, a gear type pump connected to the electric motor supplying pressure. The Elwell-Parker Electric Co.

32—SEPARATOR available with or without regulator

This oil and moisture separator for cleaning compressed air is available, with or without a regulating device. The complete unit, Model P-HLE, is a high capacity 50 cfm with power regulation for uniform air delivery, while Model HRE-501 is the oil and moisture separator alone. The combination unit regulates pressures up to 135 psi from an air



line carrying pressures up to 250 psi.

The separating unit has an all-metal centrifugal type oil and water eliminator, is said to require no replacement or maintenance. It has a permanent type filter, easily removable for cleaning, and the filter chamber can be drained by a simple valve at the bottom of the unit. The separator can be installed in air lines supplying pneumatic tools or other units requiring clean compressed air for operation. The combination unit (pictured above) costs around $41.00; separator alone, around $23.00. DeVilbiss Co.

One of these products may be "just what you're looking for." Use the handy Reader Service Cards to ask for more information on it.

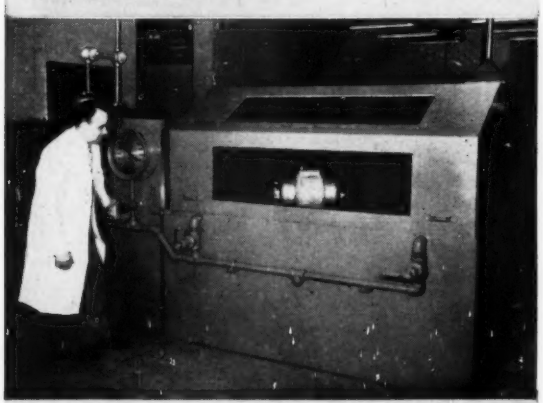
33—HYDRAULIC CRANE is independently powered unit

This manufacturer's Hydrocrane, an all-hydraulic 4-ton, ⅜-yd crane-excavator is now available as a independently powered machine. It is designed to increase horsepower and line speeds, simplify operation, reduce maintenance and extend truck engine life. While retaining advantages of the original power-takeoff driven Hydrocrane, the new model has its own power unit—a 4-cylinder industrial type engine.

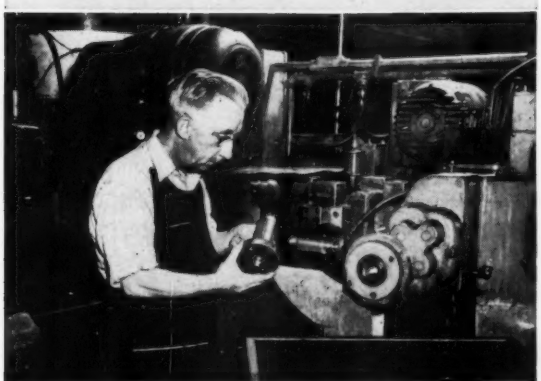
In addition to eliminating the restrictive influence of the power-takeoff drive, this self-powered unit has an improved hy-

CROUSE-HINDS rigid quality control *assures long-lasting products ...* CONDULET* records prove it!

Making a tensile strength test of a Feraloy bar in the Mechanical Laboratory. Constant testing insures uniform quality.



A hydrostatic test of a Type EPC explosion-proof Condulet. It must withstand a pressure 4 times as great as an internal explosion.



Guaging the threads of an Obround Condulet in the factory. Crouse-Hinds quality control follows through to the finished product.

The first CONDULETS, introduced by Crouse-Hinds in 1905, were so well designed and so carefully manufactured that many of the early installations are still in use.... still giving dependable service after more than forty years. This record proves that where quality counts, you can count on CONDULETS!

Crouse-Hinds high standard of quality has always been controlled by careful checking and testing of both raw materials and the finished product. The CONDULET line has expanded from a few items to more than 15,000 types and sizes and the testing laboratories have kept pace with this development. They contain the latest and most modern testing equipment.

Laboratory testing is only part of Crouse-Hinds system of rigid quality control. Factory inspection is equally important. Together, they assure a superior product that will serve you better . . . and last longer!

Always specify CONDULETS.

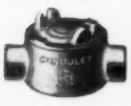
***CONDULETS are made only by CROUSE-HINDS**

CROUSE-HINDS COMPANY
Syracuse 1, N. Y.

OFFICES: Amarillo — Birmingham — Boston — Buffalo — Chicago — Cincinnati — Cleveland Dallas — Denver — Detroit — Houston — Indianapolis — Kansas City — Los Angeles — Memphis Milwaukee — New Orleans — New York — Philadelphia — Pittsburgh — Portland, Ore San Francisco — Seattle — St. Louis — St. Paul — Tulsa — Washington
RESIDENT REPRESENTATIVES: Albany — Atlanta — Baltimore — Charlotte — Chattanooga Corpus Christi — Reading, Pa. — Richmond, Va. — Shreveport
Crouse-Hinds Company of Canada, Ltd., Toronto, Ont.

Type LB
Obround Condulet

Type EVA Explosion-Proof
Lighting Fixture



Type GUAC Explosion-Proof
Junction Condulet

Type ARE
Plug Receptacle

Type FSC Tumbler
Switch Condulet

CONDULET
First in the field
STANDARD OF QUALITY

A Nationwide Distribution Through Electrical Distributors

AIRPORT LIGHTING · FLOODLIGHTS · CONDULETS · TRAFFIC SIGNALS

For more facts circle 608 on Reply Card

*HERE THEY ARE

The NEW and IMPROVED COMETS!

*PUSH BUTTON CONTROL

*PENDANT ROPE CONTROL

CM COMET ELECTRIC HOISTS

Capacities: ⅛ to 2 tons

Plug in on 110 single phase or 220-440 volt power lines

* CM COMET Electric Chain Hoists are now available in two models . . . Push Button Control or Pendant Rope Control. Designed for production line applications. Anyone can operate. One hand control, fast load spotting, flexible Herc-Alloy steel load chain, upper and lower safety limits, low power consumption, lifetime lubrication and fully enclosed working parts are just a few COMET advantages.

* The faster, more efficient overhead handling of materials and parts with CM COMET Hoists is an immediate way to increase output and reduce unit production costs. Workers' energy is conserved for full day maximum efficiency. Floor space is saved. Production moves smoothly.

COMET CATALOG . . . 18 pages of illustrated hoist information *sent on request.* Prices will be included. Write now!

CM HOISTS AND CHAIN

CHISHOLM-MOORE HOIST DIVISION

COLUMBUS McKINNON CHAIN CORPORATION

TONAWANDA, NEW YORK

DISTRICT OFFICES: NEW YORK, CHICAGO, CLEVELAND

In Canada: McKINNON COLUMBUS CHAIN LIMITED, ST. CATHARINES, ONTARIO

For more facts circle 609 on Reply Card

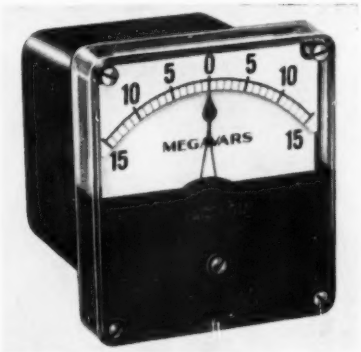
NEW PRODUCTS

(Begins on page 164)

draulic circuit. A foot operated selector valve permits hydraulic fluid from all three pumps to be channeled to one valve bank, increasing line speeds. Decreased operating costs are also claimed. There are fewer belts, shafts and hoses to require servicing, it is pointed out, and cold weather sluggishness is reduced. The price of the unit, factory mounted on a new truck chassis, is said to be only nominally more than that of the standard truck-powered unit. For mounting on special or used trucks the over-all cost to the user will be less. Bucyrus-Erie Co.

34—PANEL INSTRUMENTS have in-line pointers

Clear plastic fronts and in-line pointers and dials are features of the Model 610 group of 4½ in. switchboard and panel instruments. The plastic fronts are designed to admit maximum light on the dial from the sides, top and front, and



thus eliminate need for internal illumination under normal operating conditions. The in-line pointer and dial, in which the scale is raised in plane with the pointer tip, serve to eliminate parallax errors and permit accurate readings at an angle.

The lower portion of the plastic front is normally black, but other colors can be furnished. The instruments can also be furnished with black Bakelite fronts, with or without in-line pointers and scales. At additional cost, internal illumination can be furnished on the Bakelite instruments with flat dials. Weston Electrical Instrument Corp.

35—INDICATORS, RECORDERS for remote locations

Remote indicators and recorders with standard accuracies of one part in 2000 are announced, with higher accuracies available, if desired. Designed for weight control, the units follow a prime-mover dial scale. The weight of material fed to the automatic scale's weigh hopper is indicated on the dial scale. These readings are synchronized and duplicated on an indicator in any remote location.

Recordings may be made on circular charts, strip units or tape printers. Re-

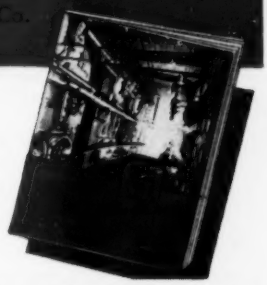
ERIE CITY VL STEAM GENERATOR

This one, fired by the Erie City Dumping Grate Spreader Stoker. Erie City VL's by the hundreds are serving a broad cross section of small to large steam users. These completely factory-assembled or field erected steam generators incorporate a 2-drum boiler and integral water cooled furnace for any mechanical firing method. We draw upon a 50 year experience with 2-drum boilers and a pioneering application of water wall design that keeps refractory maintenance to a minimum.

Only clean water can enter the integral water wall circulation. VL's are the most accessible boilers of this type—easy to keep clean and at top efficiency. Hospitals, Schools, Institutions, Dairies, Laundries, Industries and Process Plants use and repeat on VL's.

A FEW OF THE HUNDREDS OF ERIE CITY VL USERS

Cooper-Bessemer Corp.
Certain-teed Products Corp.
Dow Chemical Co.
General Chemical Co.
Pure Oil Company
Liquid Carbonic Corp.
American Zinc Co. of Illinois
American Cyanamid Co.
Welch Grape Juice Co.



Get the COMPLETE STORY . . . **on this modern 2-DRUM Steam Generator for all mechanical firing methods.** *Ask for* **SB-43B**

ERIE CITY — 77 Years in Steam Generation

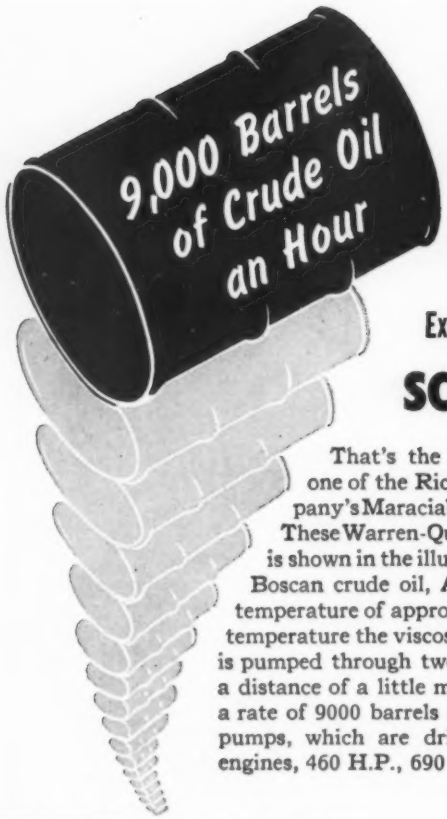
You can depend on Erie City for sound engineering

ERIE CITY IRON WORKS • *Erie, Pa.*

STEAM GENERATORS • SUPERHEATERS • ECONOMIZERS • AIR PREHEATERS

UNDERFEED AND SPREADER STOKERS • PULVERIZERS

For more facts circle 610 on Reply Card



USING 3

WARREN-QUIMBY

External Gear and Bearing

SCREW PUMPS

That's the hourly loading record at one of the Richmond Exploration Company's Maraciabo operations in Venezuela. These Warren-Quimby Pumps, one of which is shown in the illustration, are used to pump Boscan crude oil, A.P.I. Gravity 10.5°, at a temperature of approximately 160°F., at which temperature the viscosity is 6000 S. S. U. The oil is pumped through two 18″ submarine pipelines a distance of a little more than one mile and at a rate of 9000 barrels an hour, using three such pumps, which are driven by Nordberg diesel engines, 460 H.P., 690 R.P.M.

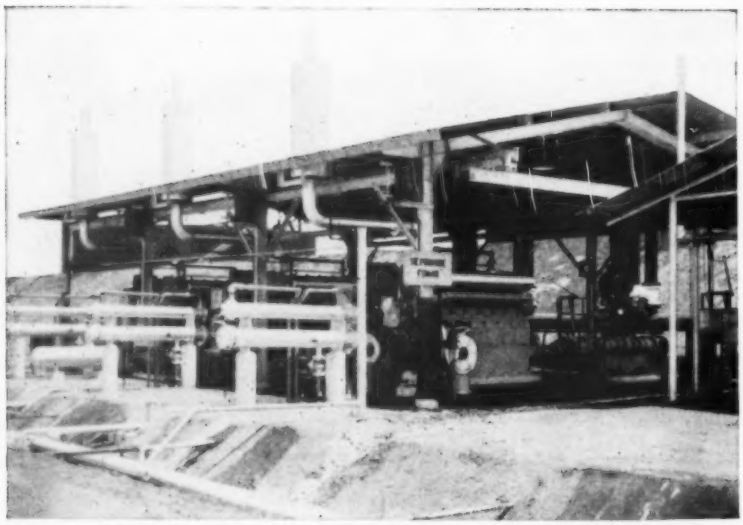


Illustration: Courtesy, Standard Oil Company of California

Whatever your pumping problem . . .

it will pay you to specify:

WARREN QUIMBY PUMPS

PQ-7

WARREN PUMPS

WARREN STEAM PUMP COMPANY, INC.

Warren, Massachusetts

For more facts circle 611 on Reply Card

NEW PRODUCTS

(Begins on page 164)

mote indicating and recording units may be hooked up to any industrial-make scale dial and any number of units run by the one prime-mover, according to company engineers. Heart of the instrumentation is manufacturer's 60-cycle servo system, consisting of a synchro transmitter, amplifier and servo mechanism made up of a servo motor and control transformer. Richardson Scale Co.

36—SCOOP SHOVELS for use on fork lift trucks

Two scoop-type shovels (hydraulic and mechanical) are offered for this manufacturer's fork lift trucks. The new attachments are designed to handle such loose or bulk materials as coal, cement, core sand, feed and fertilizer when loading and unloading. They are interchangeable with standard forks and easy to mount. Both shovels mount directly to the fork hanger bar, but the hydraulic shovel is connected to the truck's hydraulic system by quick-detachable hose coupling. The mechanical shovel is released by cam lever action. The Buda Co., Div., Allis-Chalmers Mfg. Co.

37—UNIT HEATERS for high pressure steam systems

A new series of horizontal unit heaters, designed to provide comfortable outlet temperatures on high pressure, high temperature steam systems, has been added to this manufacturer's Herman Nelson line. Low outlet temperatures at standard 2 psig rating, suggest their use for comfort heating jobs where high temperature, high pressure steam is used.

These propeller fan unit heaters can be used on steam systems of pressures to 125 psig. Capacities range from 385 to 5430 cfm (70 deg air), 17,400 to 228,000 Btu/hr (with 60 deg entering air and 2 psi steam pressure). The units are also suitable for forced hot water heating systems. Heaters have single or two-speed motors, all completely enclosed. A new catalog gives capacity and other data. American Air Filter Co., Inc.

38—PRESSURE SWITCH for heavy-duty applications

Designed specifically for heavy duty applications where day-after-day operation is vital, the Bulletin 10007 Heavy Duty Pressure Switch is claimed to be ideal for industrial air compressors. All parts with bearing surfaces are stainless steel —other operating parts are non-corrosive material or plated steel. The diaphragm, of nylon reinforced Neoprene is practically indestructible, says company, and being thin and flexible, this diaphragm assures reliable operation. Also, the silver alloy contacts are highly resistant, to welding, it is pointed out, and never need filing or cleaning. The switch has a postive snap action.

Compartment isolation of the electrical

SNYDER TANK CORPORATION REPORTS...

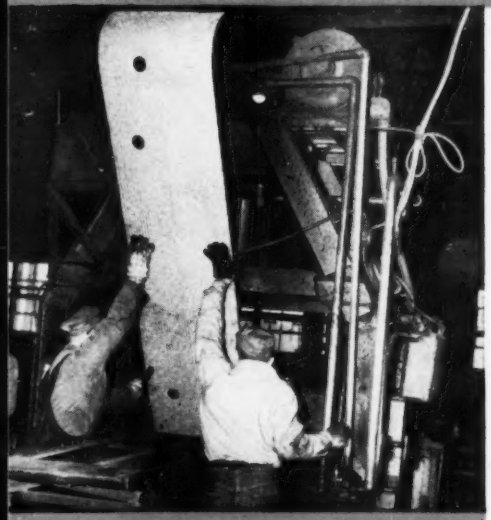
J&L Junior JAL-TREAD

Fabricates easily, economically
Provides neat, safe walking surface

Snyder Tank Corporation of Buffalo, New York, recognizes the importance of a safe footing for truck drivers when they climb into the cab or adjust the hitch. That's why, for almost ten years, the top surface of Snyder gasoline truck tanks has been made of non-slip J&L Junior Jal-tread floorplate.

Referring to the use of Junior Jal-tread on late model trucks where fuel tanks replace running boards, E. F. Olson, Sales Manager, says, "It is important to have a safe walking surface here also, because the driver must enter and leave the cab by stepping on the tank. From a customer point of view, the plate (J&L Junior Jal-tread) is neater looking too."

Regarding production costs Francis Snyder, Plant Superintendent, reports that he has less trouble fabricating J&L Junior Jal-tread than other types of steel. He adds that Jal-tread's straight line pattern of raised cleats cuts spoilage and makes fabricating, forming, punching and bending easier.



see our catalog in SWEET'S

Whatever your application in new construction, new equipment or replacement jobs, you'll find that J&L Jal-tread and Junior Jal-tread offer floorings that are long-lasting, safe, neat, easy-to-clean and easy-to-fabricate. Check the advantages of Jal-tread, the only true checkerboard floorplate, today.

Available at leading distributors everywhere

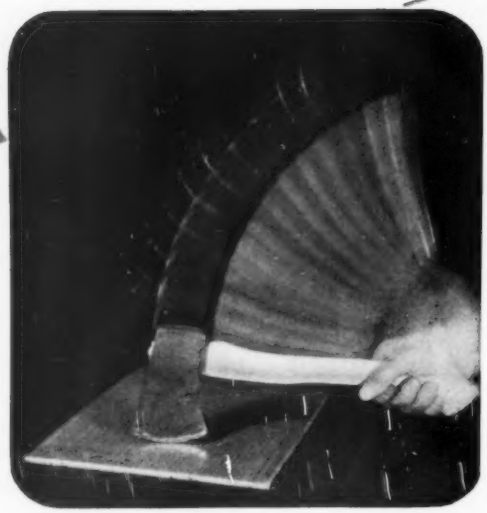
Jones & Laughlin
STEEL CORPORATION — *Pittsburgh*

J&L STEEL

For more facts circle 612 on Reply Card

Main ARMADILLO CONVEYOR BELTS

out-perform all other belts for conveying oily and abrasive, cutting materials.



An axe dropped on an ARMADILLO belt, as illustrated, will not penetrate the coating. It will pay you to get the facts from Main.

It's true . . . no other conveyor belt can withstand cutting, digging and oily conditions like ARMADILLO—a Main Belting exclusive. That is why Main ARMADILLO is preferred for conveying sharp edged metal stampings, steel tote pans, oily steel scrap and countless other materials involving oil and cutting abrasion. The secret is Main's extremely durable, glass-like, yet flexible ARMADILLO Protecto-Coating.

For long, rugged conveying service at remarkably low cost, you can't beat Main ARMADILLO.

Write for details

Main BELTING COMPANY
1241 Carpenter Street
Philadelphia 47, Pa.

For more facts circle 613 on Reply Card

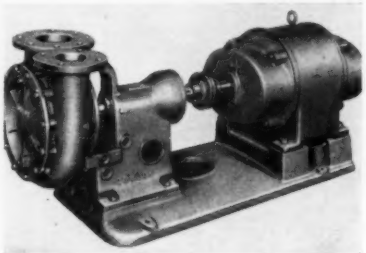
NEW PRODUCTS

(Begins on page 164)

unit from the mechanical unit is provided for trouble-free operation without possibility of wiring interfering with the working parts of the switch. It's not necessary to loop the wire or to use lugs or grommets — you simply insert skin wire and tighten with a screw driver. "Straight through" wiring is offered by conduit openings on each side of the case for a ½- or ¾-in. conduit. Case and U-shaped cover are heavy-gage steel. Details are given in Publication EC-77. Cutler-Hammer, Inc.

39—CENTRIFUGAL PUMPS for handling corrosive liquids

The Fig. 3715 series, a line of centrifugal pumps designed for handling corrosive liquids and slurries, is announced as having many advantages over company's earlier pumps. The new ones are available with the entire fluid end in special



alloys, stainless steels, or other materials. Maximum liquid temperature for operation has been raised to 350 F with provisions for water cooling of the support head and quenching of the gland. Single or double mechanical seals can be provided if desired, and bearing housings are sealed to exclude dirt and moisture.

The pump is built in nine sizes, ranging from ¾ to 3 in., providing capacities up to 720 gpm, and heads to 200 ft. Interchangeable parts are standardized. More information, including performance data on these pumps, is found in Bulletin 725.5. Goulds Pumps, Inc.

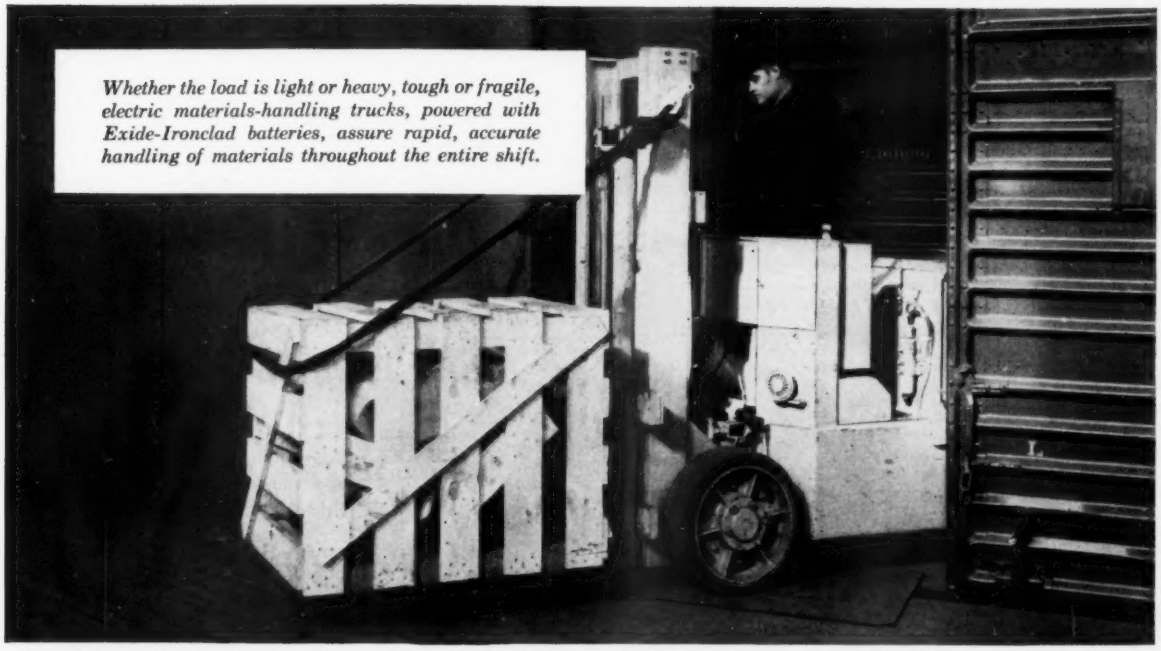
40—STRAINER for high pressure steam, feed water

For steam and boiler feed pressures above 900 lb, the SK Fig. 944-HP Strainer incorporates, in a forged steel or forged alloy body, a new "pressure seal" bonnet construction. The use of the pressure seal principle—the greater the pressure, the more secure the seal—besides making a pressure leak improbable is said to eliminate use of bulky covers and fastenings.

Gaskets utilized in this strainer are designed to provide a satisfactory seal at high temperatures. And to make the unit still more compact, blowdown connection has been brought through the side of the strainer wall. It is noted that this design means no piping need be broken when removing the cover and strainer basket from the body for main-

GET FULL SHIFT HANDLING, NO UNSCHEDULED DOWN TIME

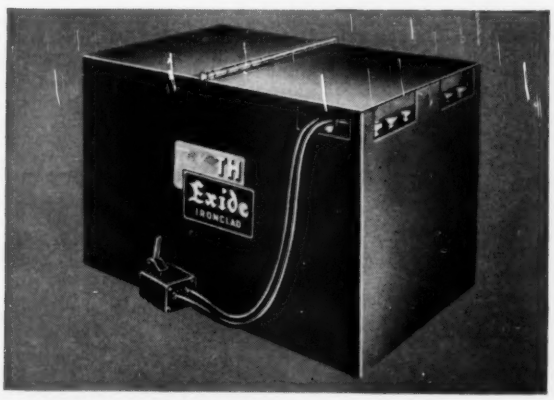
. . . with low cost Exide-Ironclad power!



Whether the load is light or heavy, tough or fragile, electric materials-handling trucks, powered with Exide-Ironclad batteries, assure rapid, accurate handling of materials throughout the entire shift.

YOU GET uniform performance throughout each shift when battery electric trucks are powered by Exide-Ironclads. Your trucks handle as much load during the last hour as during the first . . . with no unscheduled down time. Lower costs for operation, maintenance and depreciation make Exide-Ironclads your best power buy—AT ANY PRICE!

THE POSITIVE PLATES are the heart of any battery. Only Exide uses a slotted tube construction. By use of tubes, more active material is exposed to the electrolyte, providing *greater power.* Also, more active material is retained, giving *longer working life.*



THE NEW THRIFTY HAULER! The improved industrial truck battery. *Non-oxidizing* plastic power tubes assure longest battery life, more capacity in the same space. For full details, call your Exide sales engineer—write for Form 1982 (Installation and Maintenance of Motive Power).

Your best power buy . . . AT ANY PRICE!

Exide®
IRONCLAD® BATTERIES

Exide INDUSTRIAL DIVISION, The Electric Storage Battery Company, Philadelphia 2, Pa.

For more facts circle 614 on Reply Card

MOST PRACTICAL
UNIT PILLOW BLOCK YOU CAN BUY

Let your SKF *Authorized Distributor* show you the "SY" Unit Pillow Block—the *one* that offers *all* the easy-maintenance features you've wished for.

BEST BEARING SEAL MADE
SKF Red-Seal, made of DuPont "Fairprene," with friction-free wiping contact in grooved inner race. The contact seal will release excess grease without popping out.

ROTATING FLINGER
slightly overlapped by outer race, works in conjunction with seal to form a labyrinth that effectively excludes dirt.

EASY TO MOUNT
on standard shafting. Just *slide* unit on shaft to proper location, and tighten 2 set screws. Tests prove this locking device withstands vibration. Spherical outer ring compensates for initial misalignment.

INTERCHANGEABLE
The "SY" Unit Pillow Block is interchangeable with existing installations by bolt hole spacing and center height features.

ALEMITE FITTING FOR RE-LUBRICATION
Note: Also available—the "FY" Flanged Mounting—same bearing unit but with housing that mounts on surface perpendicular to shaft . . . and the Single Row, Ball Bearing Aligning Unit that can be installed in many kinds of housings.

Action

This coupon will bring you Bulletin 370, with complete description, dimensional tables, available sizes, weights, etc.

7551

SKF® BEARINGS AND PILLOW BLOCKS

SKF INDUSTRIES, INC.
Manufacturers of SKF and HESS-BRIGHT® bearings.
FRONT ST. & ERIE AVE. PHILADELPHIA 32, PA.
Send Bulletin 370. I'm interested in Pillow Blocks

for_____
(specify)
*Name*_____ *Title*_____
*Company*_____
*Address*_____
*City*_____ *Zone*____ *State*_____
*Type of plant*_____
*Approx. number Pillow Blocks in service*_____

For more facts circle 615 on Reply Card

NEW PRODUCTS

(Begins on page 164)

tenance, a factor of importance at high pressures and temperatures where pipe joints are usually welded. Bulletin 9S-HP gives data. Schutte & Koerting Co.

41—TEMPLATE with standard electronic symbols

Containing standard symbols, the No. 311 Electronic J. I. C. Symbols Template is designed for the industrial electronic, television, radio and electrical fields. Made of matte finish plastic, its over-all size is 7 by 5 in. It is priced at around $3.00. Rapidesign Inc.

42—CAPACITORS, new design, for air conditioners

Newly-designed capacitors for air conditioners that can individually provide the power factor correction of two single capacitors of the same voltage ratings are announced. The units are generally less costly, occupy less space, weigh less and require less handling than two single

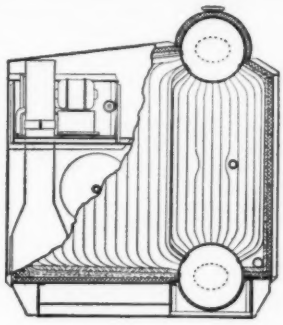
capacitors, company points out. They can be applied where electrical circuits in air conditioners are designed for two running capacitors and a method of switching.

Enclosed in solderless steel case, units are composed internally of low-loss Kraft paper and dead-soft annealed aluminum foil impregnated with company's dielectric. Two types of bushing terminals are available: fork terminals and quick-connect (solderless) terminals. Each unit has three bushings, one of which is common to both sections. Capacitors are available in voltage ratings of 236, 250, 330, and 440 v a-c with selective microfarad ratings. General Electric Co.

43—FLOODLIGHT has variety of mounting possibilities

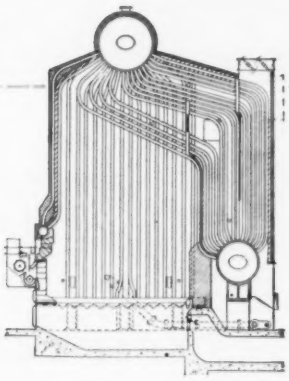
Because this new general purpose floodlight, the Type MDB-10, is available with either flat base or suspension assemblies, it may be installed in grounds, lawns or turf as well as on elevated arm brackets. The 6-in. diam flat steel base, for ground locations, has two mounting holes to fit a 4-in. outlet box and a 1½-in. knockout. For temporary mounting, a steel ground stake is available. Unlike the flat base, which has 4 ft of two-conductor cable with plug, the aluminum suspension base

WHICH C-E BOILER MEETS YOUR STEAM NEEDS BEST?

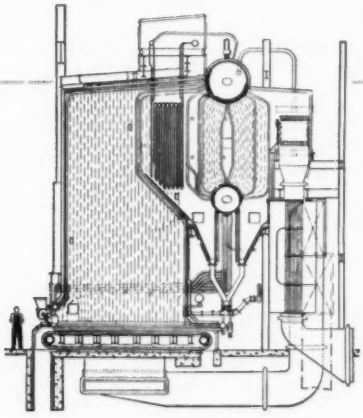


C-E Package Boiler—Type VP—The VP Boiler is designed to meet the demand for compact, standardized units in the medium pressure range. It is shipped completely shop-assembled, with firing equipment, fittings, and forced-draft fan. It is enclosed in a reinforced, welded steel, gas-tight casing. Arranged for pressure firing of oil or gas, the VP will burn either fuel exclusively or alternately. Designed for shipment by rail or truck, its width and height remain constant . . . variations are made in length only. Furnace is fully water-cooled, including burner wall, except in three smallest sizes. Large lower drum permits simple, symmetrical tube arrangement and greater water storage capacity.

Type VP Boiler—from 4,000 to 30,000 lb steam per hr . . . pressure to 250 psi . . . available for either gas or oil firing . . . fully shop-assembled.



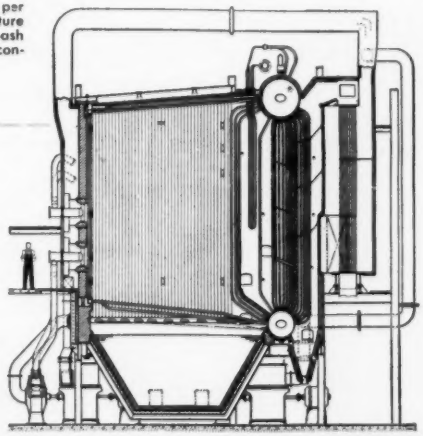
C-E Vertical-Unit Boiler—Type VU-10—Like the Type VP Package Boiler, the VU-10 is designed for plants having a limited number of operating and maintenance personnel. It is designed for industrial load conditions and will operate efficiently over a wide range of output. The boiler is bottom supported and has no outside supporting steel. The same general cross-section arrangement of drums, boiler convection bank, and furnace wall cooling is used when firing oil, gas or coal. Coal firing may be with underfeed, spreader, or chain grate stokers.



Type VU-10 Boiler—from 10,000 to 60,000 lb steam per hr . . . pressure to 475 psi . . . superheat to 200 F . . . suitable for any type of fuel.

C-E Vertical-Unit Boiler—Type VU-40—The VU-40 Boiler is a baffleless boiler designed for use with fuels having abrasive qualities in the flue dust. In a baffled boiler using these abrasive fuels, erosion is apt to occur. In the VU-40 Type Boiler, the eroding action of abrasives against boiler tubes and refractory is virtually eliminated. Like the VU-10 and VU-50, this unit is of symmetrical design, providing uniform gas flow and heat absorption across the full width of the boiler.

Type VU-40 Boiler—from 60,000 lb steam per hr up . . . pressure to 1375 psi . . . temperature to 960 F . . . for use with abrasive or high ash content fuel . . . indoor or outdoor type construction.



C-E Vertical-Unit Boiler—Type VU-50—With the VU-50 Boiler, the average plant can achieve standards of performance closely approaching those of large central power stations. The basic design was originated by Combustion in 1925 and has been widely accepted among steam-power engineers *everywhere*. Because of its symmetrical design the VU-50 provides uniformity of gas flow, water level and steam release across the full width of the unit. It may be fired by pulverized coal as shown opposite or by any other fuel or method of firing. Heat recovery equipment may be added.

Type VU-50 Boiler—from 60,000 to 350,000 lb steam per hr . . . pressure to 1375 psi . . . temperature to 960 F . . . for any fuel or method of firing . . . indoor or outdoor type construction.

B-703A

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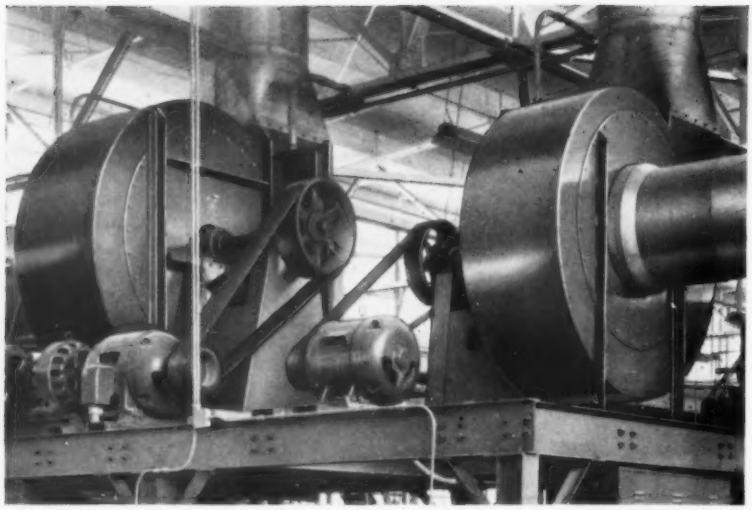

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NEW PRODUCTS

(Begins on page 164)

has a ½-in. conduit thread and 2 ft of cable with terminals for attaching to the terminal block of a cross arm for installation on poles.

Of lightweight sheet aluminum, the new floodlight is 11-⅞ in. long and 11-⅛ in. across the lens. With a 100-deg etched Alzak finish reflector, the light delivers a 58.5 per cent beam efficiency, says company, and with 35-deg polished Alzak finish reflectors, beam efficiency ranges between 42.9 and 48.4 per cent. Either 200- or 300-w bulbs are used for general lighting service; colored lenses require only 200-w lamps. The fixture is designed for easy re-lamping without tools. Technical Bulletin 386-F gives full data. Crouse-Hinds Co.

44—SPEED REDUCERS come in 60 standard ratios

A new and expanded line of herringbone gear speed reducers, in the range from 1 to 1950 hp, offers more standard size drives and more standard ratios for every size. The units are produced in 60 standard ratios ranging from 1.27 to 1 up to 355.8 to 1. All units are available in types suitable for either coupled or overhung load applications. There are nine standard shaft extension assemblies, two standard bed plate styles.

Features announced for the line include precision generated herringbone gearing of higher hardness; symmetrical, balanced gearing and bearing arrangement; anti-friction bearings. W. A. Jones Foundry & Machine Co.

It's easy to obtain product data with the postage-free Reader Service Cards provided on pages 215-216. Use them for information on advertised products, too. Just circle the key number appearing at bottom of the ad.

45—TOOL BITS available in two types, 12 sizes

High speed ground tool bits and cobalt ground tool bits, two recently introduced lines, are announced as made of high grades of steel accurately ground on all four sides with ends bevelled 10 deg. Both types come in a range of 12 sizes from $\frac{3}{16}$- to 1¼-in. sq. Armstrong Bros. Tool Co.

46—TOGGLE SWITCHES are three-position assemblies

In this new series of tiny, three-position, panel-mounting "subminiature" toggle switch assemblies, each has two single-pole, double-throw basic switching units, providing control of up to four circuits. One unit is actuated in each

ORTON *Torque-Control** CRANES

THE MAN WHO OWNS ONE CAN TELL YOU

These firms are among those which have purchased ORTON *Torque-Control Cranes since the introduction of *Torque-Control** *in 1951.***

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Ft. Dodge Iron & Metal Co.
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Purdue University
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Dierks Lbr. & Coal Co.
Process City, Ark.

Pacific Fruit Express
San Bernadino, Calif.

Public Service Co. of Ind.
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Chicago Hardware Fdry. Co.
North Chicago, Ill.

Standard Steel Works
Burnham, Pa.

Canadian National Ry.
St. Johns, Newfoundland

General Steel Castings Corp.
Eddystone, Pa.

Lone Star Steel Corp.
Lone Star, Tex.

Indianapolis Power & Light
Indianapolis, Ind.

Dominion Steel & Coal Corp.
Sydney, N.S., Canada

Sternoff Metals & Iron Co.
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Bond Brothers
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Johannesburg, So. Africa

Altos Hornos de Mexico
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General American Transportation Corp.
Sharon, Pa.

Potlatch Forest, Inc.
Lewiston, Idaho

Chevrolet-Detroit Forge Div. of Gen. Motors Corp.

Army Transportation Corps

Ill. Slag & Ballast Co.
Chicago, Ill.

Santa Fe Railway

Reilly Tar & Chemical Co.
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Robinson Bros. & Co.
Chicago, Ill.

Calumet Steel Div.
Borg-Warner Corp.
Chicago Heights, Ill.

Transp. Research and Development Sta.
Ft. Eustis, Va.

Svenska Cellulosa
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Vivstavarv, Sweden

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You Wouldn't think . . .
of wiring your plant without the protection of circuit breakers in the line!
Yet it is just as DANGEROUS to operate pressured systems without the protection of
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Just as an electrical circuit breaker protects your personnel, plant and equipment from electrical overloads, shorts and "burn-outs", so does the BS&B Safety Head protect them from the dangers of overpressure in pressured systems.

The BS&B Safety Head is a patented pressure relief device that is designed to become an integral part of any pressured system containing air, gas or liquid—either bland or corrosive.

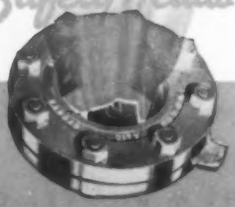
The rupture disc of the BS&B Safety Head is custom fabricated to the specific requirements of the system of which it is a part. It provides a full pipe-sized vent for *instantaneous* relief before the pressure exceeds the safety limits of the system.

The BS&B Safety Head is especially suited to use in oil and gas producing fields, pipe lines, refineries, chemical plants, power plants and the refrigeration industry. It may be used as either a primary or secondary relief device, and either upstream or downstream from a relief valve, as varying conditions may require.

If you aren't already using BS&B Safety Heads in *your* plant, we'd suggest you get in touch with your nearest BS&B representative without delay. Or write for complete BS&B Safety Head Catalog. There's no obligation.

BS&B
Safety Heads

THE "CIRCUIT-BREAKER" OF
Any Pressured System



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Safety Head Division, Dept. 2-P9
7500 East 12th St., Kansas City 26, Mo.

SAFETY BS&B HEADS OVER 60 YEARS

NEW PRODUCTS

(Begins on page 164)

extreme toggle position, but neither is actuated in the center position. However, company points out, it's possible to have three different combinations of two circuits open and two closed at any time. The maintained toggle positions are detented to provide a positive feel of the position, and momentary positions are spring loaded to return to "off" position.

Electrical rating of the switches used in each assembly is: 125, 250 v a-c, 5 amp; 30 v d-c, 3 amp inductive at sea level, 2.5 amp inductive at 50,000 ft, 4 amp resistive at sea level and 4 amp resistive at 50,000 ft. Switches have a standard bushing and bat handle. Micro Switch, Div., Minneapolis-Honeywell Regulator Co.

47—VIBRATION ANALYZER has six amplitude ranges

The TIC Vibration Analyzer is a portable combination instrument for measuring amplitude and frequency of steady-state vibrations for the degree and frequency of out-of-balance conditions in rotating or moving mechanisms. Designed to meet the most common balancing problems in variable speed and synchronous

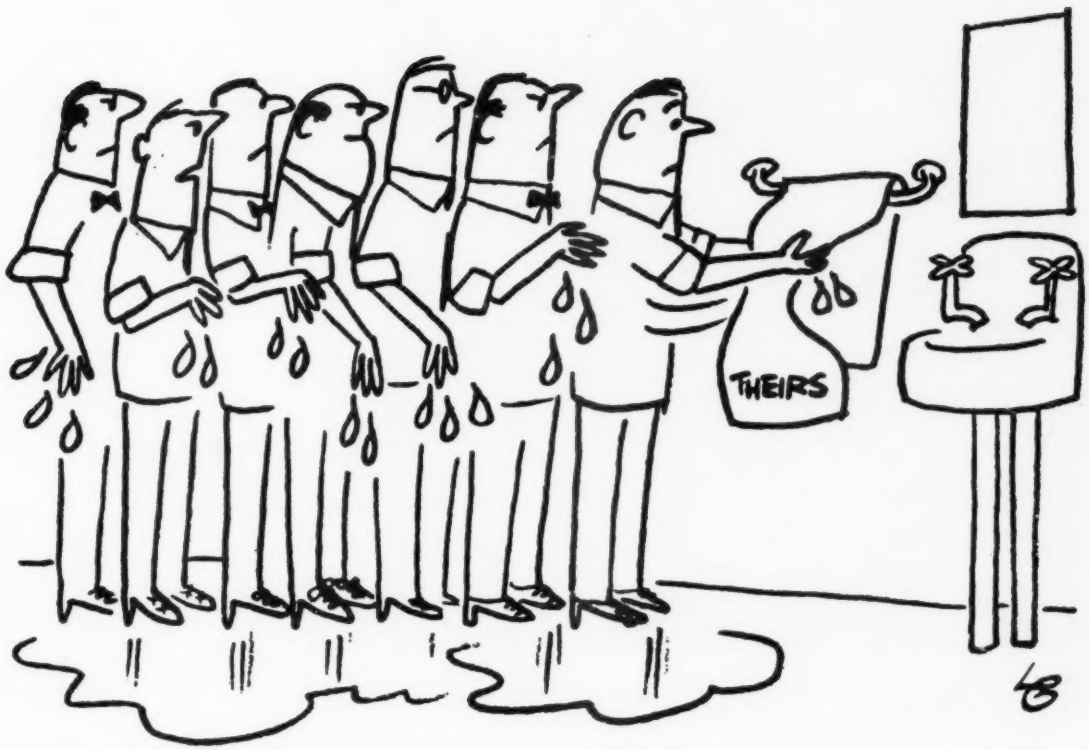
machinery, the instrument is provided with six amplitude ranges, two frequency ranges, a relative phase angle indicator for synchronous analysis — two pick-up connections, a variable frequency oscillator for tachometer application, a strobotron flash, front panel terminals for connecting oscilloscope.

The following accessories can be furnished: wooden carrying case with storage holds, a strobotron, two pick-ups, either hand-held probe or mountable flat base types, frequency meter and cables. Technical Instrument Co.

48—DRAFT INDUCER has interchangeable side panels

This furnace draft inducer with capacity range to 100,000 per hour, has interchangeable side panels to permit easy adaptation to installation requirements for gas inlet and outlet openings. The four side panels surrounding the motor-fan may be unbolted and shifted as desired. A barometric may be used, replacing one of the side panels. Moveable mounting feet allow for four different mounting positions. Other new features are included: motor and fan assembly withdrawable;

For more facts circle 619 on Reply Card



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2. They're strong — even when soaking wet.
3. They're so soft that many people use them as face cloths.
4. They're clean and white — of course.
5. They're double-fold to dry double-quick.

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ScotTissue Towels have an exceptionally high fiber content. This "bulk," plus generous size and double fold, make a case of 3,750 ScotTissue Towels weigh 46 lbs.* Some paper towels cost less for 3,750 but are 10 to 20 lbs. lighter*— hence less drying power. Write for more facts. Scott Paper Company, Dept. PE-8, Chester, Pa.

*Shipping weight

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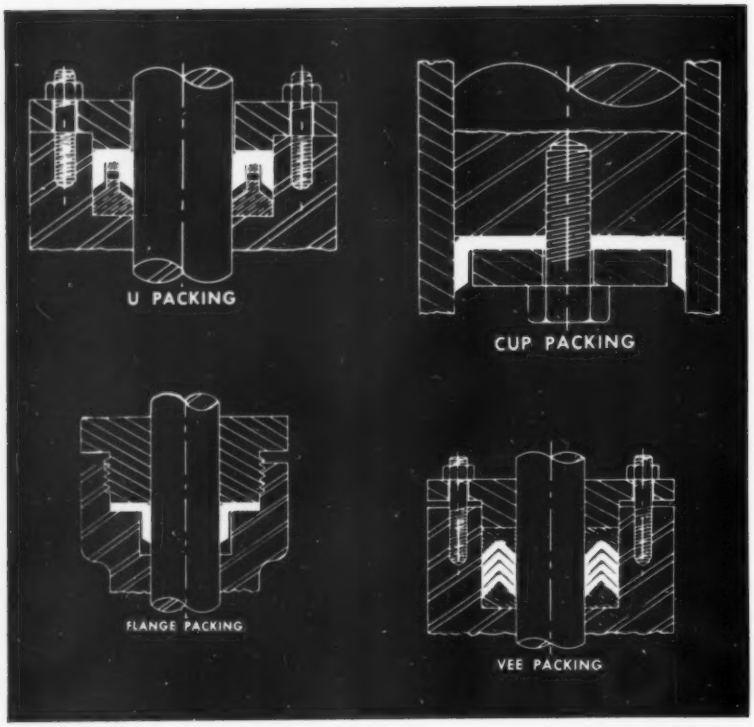

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NEW PRODUCTS

(Begins on page 164)

spring-mounted motor and V-belt drive to prevent misalignment; variable speed motor for precise draft control, and pre-sealed bearings. Wing Mfg. Co.

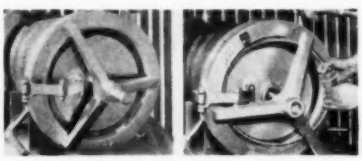
49—BOILER UNITS are compact and economical

Model TP Steam Generators are "pocket size" automatic package boiler units in the low price range, available in seven sizes from 15 to 60 hp (15 to 200 lb working pressure), for firing with light oil or gas or combination of these fuels. The units are designed to meet the need for an economical, automatic source of steam or hot water for small plants requiring the smaller capacities. Their small size—one model is 71 in. long, 35 in. wide at base, and 54 in. high—facilitates installation in limited space and affords flexibility in that other units may be added later to meet increased capacity requirements. Model TPS are fully piped and wired, need only to be connected to service lines and breeching or stack. Bulletin TP-1 describes them. Ames Iron Works.

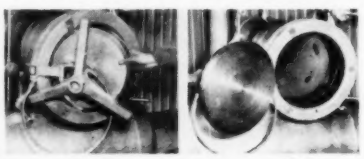
50—CLOSURE for pressure vessels, and piping systems

The Flex Ring Closure incorporates an internal pressure closing, metal-to-metal seal principle—it seals tighter as pressure on it increases. This closure is said to require less opening and closing time, and is described as having fewer parts than many seals and being lighter in weight. It consists of weld neck, plug, spider and flexible metal gasket held in compression between plug and weld neck.

To assemble, the gasket is flexed so it can pass through the plug opening, and the spider nut tightened to cause the gasket to return to a round shape for proper seating position. The equally simple disassembly procedure is illustrated

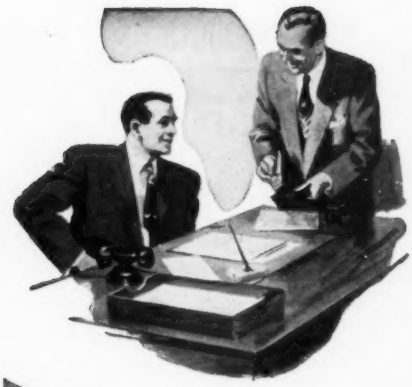


in these photos which show the unit assembled as in service, above left, and the spider released and gasket being removed. Below, at left, the gasket has



been removed and the plug rotated to open. The last photo shows the unit open.

Flex Ring Closures are available in same pressure ratings as ASA flanges, have same pressure and temperature



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See Rust-Oleum 769 Damp-Proof Red Primer actually applied over a badly rusted surface after simple scraping and wire-brushing to remove rust scale and loose rust in the Rust-Oleum *"rusted panel demonstration."* Rust-Oleum's specially-processed fish oil vehicle *penetrates* rust to bare metal usually eliminating sandblasting and other costly surface preparations.

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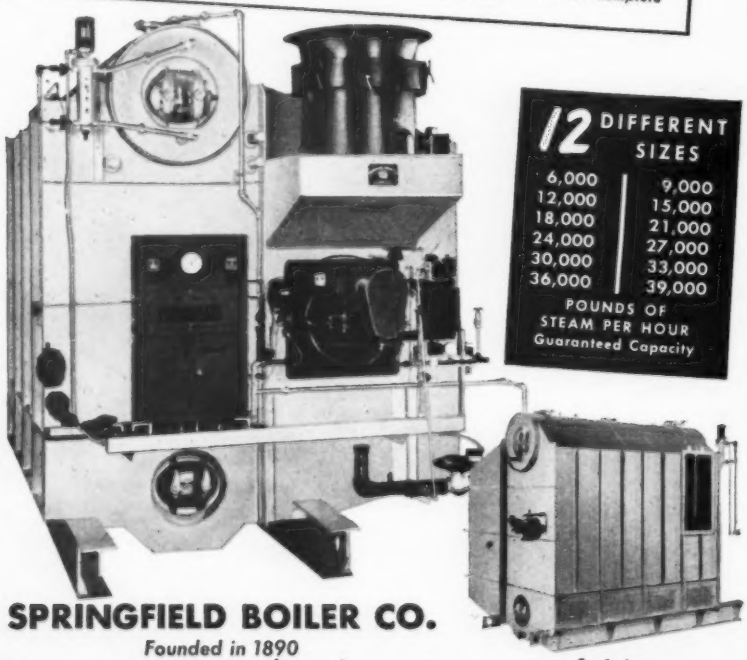
✓	**2.** FURNACE—Complete "6 wall" furnace cooling for greatest capacity. Permits higher heat release rates with lower actual "heat loading" of tubes.
✓	**3.** DRY STEAM—Steaming tubes discharge above top drum water level. Available with superheat to 200°.
✓	**4.** ENCLOSURE—Exclusive gas-tight, insulated, double-cased steel jacket. Sectional construction makes all tubes easily accessible and replaceable without necessity of tearing out and repairing side wall setting.
✓	**5.** PRESSURIZED FIRING—No induced draft fan or tall stack required. Suitable for indoor or outdoor installation. Compact, portable.
✓	**6.** EASY TO CLEAN—Quick, easy acid cleaning by qualified personnel is permissible. Clean internal design; no difficult pockets or corners, no hand holes—all tubes connect directly to drums.
✓	**7.** EFFICIENCY—Over 81% with oil. Automatic, semi-automatic, or manual control. Gas, oil, or combination firing. Underwriters' approved.
✓	**8.** COMPLETE UNITS—Ready to connect to fuel, water, electrical, and steam lines—with no extras required for setting and other materials. Design pressures of 200, 300, 600, and 900 psig. Send for complete information.



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30,000	33,000
36,000	39,000

POUNDS OF STEAM PER HOUR Guaranteed Capacity

SPRINGFIELD BOILER CO.

Founded in 1890

A DIVISION OF John W. Hobbs Corporation

1911 East Capitol Avenue • Springfield, Illinois

Ask for Latest Catalog

For more facts circle 623 on Reply Card

NEW PRODUCTS

(Begins on page 164)

rating as corresponding ASA raised face flange, and are adaptable to special designs and materials. Bulletin 3000 contains details. Sillers Engineering Co.

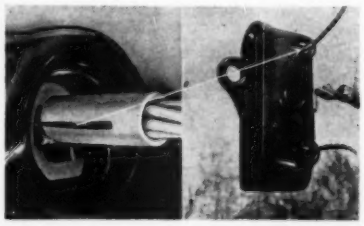
51—PULLERS for all maintenance requirements

A new line of 127 pullers and pulling attachments includes 30 two- and three-arm pullers which spread to hold up to 36-in. diam and have capacities to 50 tons. A "power-pitched" buttress thread enables mechanics to develop 30 per cent more torque than with standard thread, says manufacturer, and this makes it easier to create the increased force often needed. Lips of pulling arms are reversible for inside and outside pulling, and basic parts are interchangeable between corresponding sizes of two- and three-arm pullers. Blackhawk Mfg. Co.

52—CONNECTOR joins aluminum to copper conductor

Interchangeable use of aluminum and copper electrical conductor in switch and control equipment is possible with this connecting device, says its developer. Called an aluminum cable adapter, it's expected to solve a major problem in distribution circuits, especially since price advantages and availability suggest aluminum as an electrical conductor in many applications. The adapter comes in straight and right angle types for Nos. 4 and 2 stranded aluminum cable.

Made from a tin-plated copper alloy, this adapter is designed to combine good electrical conductivity with springiness. It has a round barrel from which extends a smaller, split cylinder called a

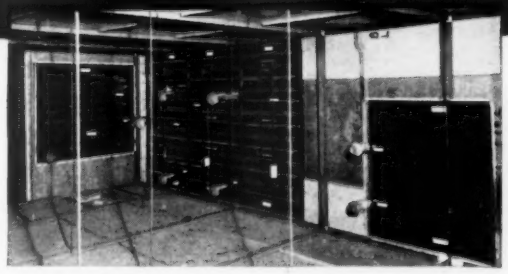


tang. The barrel fits on the cable and the tang is inserted under the equipment clamp. The slot that splits the tank extends into the barrel, forming two legs. When clamped, these are squeezed together like cantilever springs. This spring pressure compensates for any expansion and contraction.

It is explained that since the oxide film forming on aluminum has high electrical resistance, cleaning action is built into this connector. And a factory applied oxide inhibiting compound seals the joint from air and moisture. Its copper-alloy construction serves to protect the ductile aluminum cable from mechanical damage by electrical equipment clamps; its coat of tin plate resists galvanic corrosion. The Thomas & Betts Co.

perfect working weather *all year 'round* with

JOHNSON AUTOMATIC TEMPERATURE CONTROL



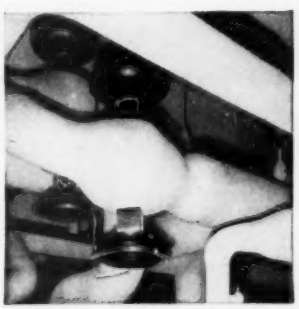
Addition to The Cincinnati Gas & Electric Company, Cincinnati, Ohio. The Union Central Life Insurance Company, owner. The Cincinnati Gas & Electric Company, lessee. Harry Hake & Harry Hake, Jr., architects; James E. Allan, mechanical engineer; Frank Messer & Sons, Inc., general contractor; Peck-Hannaford & Briggs, heating, ventilating and air conditioning contractors, all of Cincinnati.

Inside this duct Johnson Damper Operators and Dampers insure precision control of the minimum and maximum outdoor air supply for Weathermaster units throughout the building.

Perfect indoor climate gives workers a big lift in the new Cincinnati Gas & Electric Company addition. Regardless of the outdoor temperatures, employees here enjoy healthful, refreshing climate-controlled weather that keeps worker efficiency and morale at peak levels.

Like the older adjoining building, this new air conditioned addition is equipped with a modern "Planned-for-the-Purpose" Johnson System of Automatic Temperature Control. On this, and *every other installation*, Johnson Control is tailored to the exact needs of the building and its occupants. Each Johnson System is planned, made and installed by Johnson to insure the desired results at the lowest possible operating cost.

Johnson engineers, working with heating and ventilating engineers, architects, owners and builders, have helped to plan control systems for the nation's outstanding office buildings, schools, hospitals, industrial plants, department stores and public buildings from coast to coast. Let a Johnson engineer from a nearby branch office solve your next temperature control problem. A talk involves no obligation. JOHNSON SERVICE COMPANY, Milwaukee 2, Wisconsin. Direct Branch Offices in Principal Cities.



Thermostatically operated Johnson Double Diaphragm Valves are installed on chilled water and condensate lines for summer-winter changeover of the central air conditioning system.

JOHNSON CONTROL

TEMPERATURE AIR CONDITIONING

MANUFACTURING • PLANNING • INSTALLING • SINCE 1885

For more facts circle 624 on Reply Card

What an Instrument Department Might Do in Your Plant . . . I

(Continued from page 98)

ment and control problems by himself has a difficult time utilizing this approach because he does not have the complete picutre and the background that would have been gained by the cooperative effort of the instrument group. It is recognized that much of the work of the instrument man is preparing requisitions for equipment. Much of this equipment, such as pressure gauges or thermometers, is quite simple; although the time involved in the necessary considerations often reaches into days or weeks.

One of the first functions of an instrument group is to standardize the requisitioning procedure for this type of equipment as well as for the more complicated instruments and instrument systems.

Who should you select to study special problems in automation or measurement? You have two choices. One is to select the man who is conversant with this type of work. The other is to select the man who has no assignment at the moment. With an instrument department, you turn this problem over to the chief instrument engineer. He takes somewhat the same approach, depending upon his own personnel; but he can be confident that each one of the men has some accumulated background on which to base his work in order to solve the special problem.

In the southern California instrument department previously mentioned, it would be natural to turn the problem over to the so-called specialist in the line. Under any circumstances, the member of the instrument department, because of his social and technical connections with other men in the business and because of the suppliers and their products, and his understanding of the basic theory of instrumentation, will turn out a report on the special project in a much more economical manner than could possibly be expected from the engineer who would be required to attack the subject "cold."

The instrument department is the most economical approach to handling the instrumentation in your company. There are numerous reasons for this, which may have become evident in the past paragraphs. Requisitioning instruments and accessories is one of the most time-consuming procedures of a design project. In an instrument department, the most untrained men may be assigned to this work. It is very possible that girl employees with clerical background may be used for much of this work.

Female personnel may contribute much to the activity of the instrument department. Probably many times you have noticed the high-priced engineer sitting at his desk folding blue prints. There is no excuse for using this man's time in such pursuits. The work of a department may be divided so that all of the handling of correspondence, records of progress and orders, the obtaining and distribution of drawings, and even requisitioning of certain accessories and simpler instruments may be assigned to a young lady who has had very little training and who may have not much interest in the activity of the department.

In most cases this could not be done by the random assignment method. The work of this person with the instrument assignment within the project engineer's group is not enough to keep this girl busy and does not justify the time it would take to train her. But if her efforts are directed towards the same type of work as the instrument group, she will find herself busy during all working hours.

Function of the Supervisor

Most of this discussion has assumed assignments of a prolonged nature—large plants, large steam boiler installations and such—but one of the big advantages of the instrument department is its ability to handle very small assignments also. This can only be done by having a supervisor who knows at all times what each one of his men is doing. We have all experienced the delay caused by waiting for vital information from either a supplier or a client.

The supervisor with the proper relationship between himself and his men will be aware of these periods and may make short assignments which may consume a few hours or a few days in order to take up the slack. Again, the member of the instrument department takes on these assignments and completes them rapidly due to the lack of necessity for gaining the proper background for each one. Depending upon the company organization, these assignments come to the chief instrument engineer in the form of a work order or a memo, and the report, whether it be short or long, is returned in written form to the engineer who has requested the work.

Although the procedure on page— for handling instrumentation on a job is designed for a complete plant or fairly large job, it will be found that most of the items must be included in fairly small assignments also. The following is a general approach and can be applied to a large portion of the jobs handled.

BUY ASARCON CONTINUOUS-CAST BRONZES FROM THESE DISTRIBUTORS

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San Francisco and Los Angeles
with broad coverage in 11 western states

For more facts circle 625 on Reply Card

Why Asarcon 773 (SAE 660) bearing bronze COSTS LESS than other bronzes even at 20¢ more per pound

1. Let's say you need three 1" I.D. x 2" O.D. bronze bearings, each 5" long.

2. If you buy ordinary semi-machined bars in 13" lengths, you must order two of them to do this job. You may pay as little as *55¢/lb. You must buy about 21 lbs. This costs $11.55.

3. BUT, if you order Asarcon 773, you get the exact length you need, probably 15¼". You might pay *75¢/lb. You buy 12.3 pounds. This costs $9.23. Saving: $2.32, which is 20%!

4. Test your own case: Put in below the price YOU pay for maintenance bronze. Assume that Asarcon 773 costs 75¢/lb. See for yourself how much less the superior Asarcon 773 really costs.

ORDINARY SAE 660 BRONZE (Semi-machined)		ASARCON 773 BRONZE	
Needed:	21 lbs.	Needed:	12.3 lbs.
You pay	____¢/lb.	You pay up to 75¢/lb.	
Your cost	$_____	Your cost:	$9.23

5. The comparison up to now has been with semi-machined 13" bars. If you use rough-cast bars, commonly involving 1/4" cleanup on diameters, the economy in using Asarcon 773 is even greater. (In this case use 29.2 lbs. for the rough-cast weight in the test to the left.)

Cleanup allowances on Asarcon 773 are minimum: 1/32" on diameters up to 4"; 1/16" on diameters of 4" and larger.

Asarcon 773 (SAE 660) bronze is continuously cast without sand by a patented process. It is sound, uniform, dense. Physical properties are up to 100% better than in the same alloy cast by other methods.

And you can buy it from stock in any length you need, long or short, up to 105". It is available in 216 sizes and shapes.

In addition to the standard Asarcon 773 stock, you can get Continuous-Cast Bronzes made to order in a wide variety of alloys and shapes . . . up to 20' in length.

Mail coupon below for NEW bulletin on Asarcon 773 bearing bronze.

ASARCON 773 bearing bronze is stocked by the distributors in the column to the left

* These prices are approximate. They vary with market conditions but since both are dependent upon the price of the base metals of which they are made, the relation between them remains much the same.

ASARCO
CONTINUOUS-CAST
RODS · TUBES · SHAPES

AMERICAN SMELTING AND REFINING COMPANY
Perth Amboy Plant, Barber, New Jersey

AMERICAN SMELTING AND REFINING COMPANY
PERTH AMBOY PLANT, BARBER, NEW JERSEY

- ☐ Please send new brochure on Asarcon 773 stock bearing bronze
- ☐ Send literature on other Continuous-Cast Bronzes
- ☐ Send a salesman

Name_____ Title_____

Company_____

Address_____

City_____ Zone____ State_____

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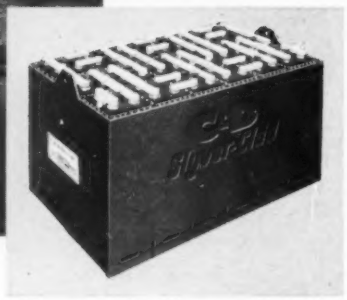
At United States Plywood Corp.—

Rapid order filling in U.S. Plywood's Philadelphia, Pa. warehouse is helped by modern materials handling methods.



C & D Batteries for EXTRA work

United States Plywood Corporation, the world's largest plywood organization, manufactures a wide variety of plywoods and related products. To help handle the millions of pounds of material moving through its 73 warehouses from coast to coast, U.S. Plywood uses C&D Slyver-Clad* batteries as a major source of power for many of the industrial trucks in daily operation. For U.S. Plywood, like hundreds of other important American companies, has found it pays to power with C&D Slyver-Clad batteries.

C&D Slyver-Clad batteries are approved as standard equipment by all electric truck manufacturers. For further information, write for catalogs.

*T.M. Reg.

C&D

BATTERIES, INC.

of Conshohocken, Pa.

Manufacturers of Industrial Batteries since 1906

SALES AND SERVICE OFFICES IN PRINCIPAL CITIES FROM COAST TO COAST

For more facts circle 627 on Reply Card

Exterminator Service

(Continued from page 113)

this way 300 to 500 birds have been trapped in a few days.

In the case of the airlines, the pigeons not only deface the buildings and once in a while deface a worker too, but they also get into standing planes waiting for maintenance—and leave mites and fleas (as well as droppings) that have to be exterminated.

Experience has shown certain things the Plant Engineering Department can do—and some things it can't do to get the most from the Contract-Exterminator Service. Briefly enumerated below is a list of things that have worked to the mutual advantage of all concerned:

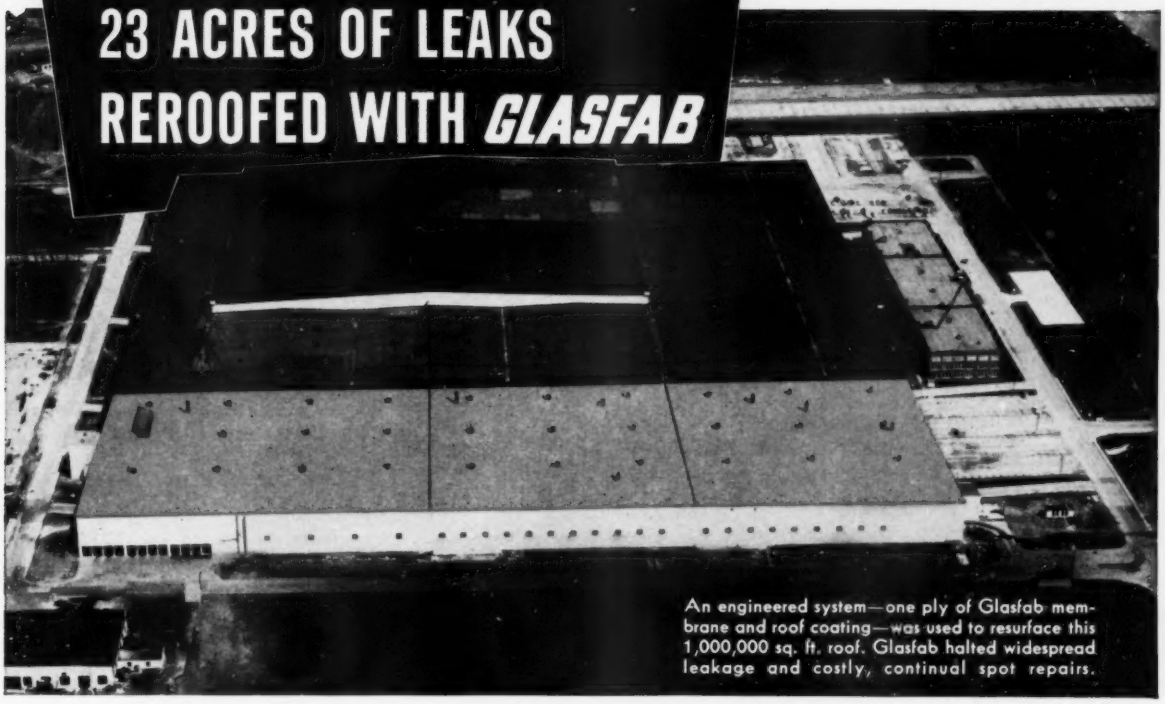
What Plant Engineering Can Do

1. First, require a responsible person in each area to sign the exterminator serviceman's service slip.
2. Establish direct channels for reporting any trouble,—through each section head—so a complete picture of the plant problem can be given the exterminator service.
3. Combine insect and rodent infestation check with fire prevention check. (At Pan American, fire prevention teams check twice a week.)
4. Have ground crews maintain clear grounds; dispose of trash; keep brush and high grass under control.
5. Locate trash pick-up points well away from buildings.
6. Keep contract exterminator advised of any special trouble areas. (The exterminator is not a magician: if there is a city dump a few hundred yards away, the exterminator may only be able to bring the problem down to a certain level.) Where freight or fabrics are being brought in, the exterminator cannot prevent infestation, he can only control it. Delivery of eggs, potatoes, etc., also bring in roaches and bugs.
7. Have maintenance crews clean-up spilled poisoned cornmeal and water used in rat control. It is unpalatable to rats.

What Employees Can Do

1. Don't leave exposed food around, especially overnight.
2. Eliminate harborage for pests: coffee spoons or candy wrappers thrown in dark corners or inaccessible holes and crannies; storage habits (stationery or supplies) resulting in dead areas that go untouched for long periods of time. If stored items keep moving toward eventual use, infestation is not likely;—but forgotten storage can provide a breeding ground.
3. Cooperate with the exterminator

23 ACRES OF LEAKS REROOFED WITH *GLASFAB*



An engineered system—one ply of Glasfab membrane and roof coating—was used to resurface this 1,000,000 sq. ft. roof. Glasfab halted widespread leakage and costly, continual spot repairs.

Recently, 23 acres of leaks at a large midwestern tank arsenal were converted into dependable, water-tight roofing.

With the new *Glasfab system of roof maintenance.*

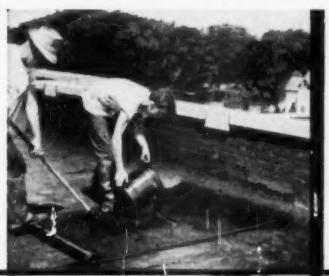
Cost of resurfacing this badly deteriorated roof with the Glasfab system was some 33⅓% less than a standard 3-ply application of asphalt-saturated roofing felts. A single-ply construction of Glasfab and asphalt coating assure 10 years' of trouble-free protection . . . with no recoating necessary.

Glasfab, the fiber glass roofing membrane, was selected to solve this difficult leakage problem because of its outstanding economy; simple, fool-proof installation; and positive, long-lasting results. Strong and virtually indestructible, Glasfab has an open-mesh weave which assures better reinforcement of roof coatings.

Glasfab produces a flexible roof surface that is tough and water-tight—and stays that way despite punishing roof traffic. Glasfab is available in lightweight, easy-to-handle rolls so that your own maintenance crew can install it. Or your roofing contractor will be glad to install Glasfab.

Your roof-top problems may involve complete resurfacing or the repair of spot leaks, flashings or gutters—in any case you will get better results at less cost with Glasfab . . . it's "tops for topside protection".

here's the *GLASFAB* method for resurfacing roofs...



Glasfab method is simple and fool-proof. Glasfab is rolled out and all coating applied over it. Open weave assures penetration of coating.

Coating is smoothed out to produce a long-wearing surface firmly bonded to old roof. Coating is strongly reinforced, stays water-tight.

THE MODERN FIBER GLASS ROOFING MEMBRANE

GLASFAB

Tops for Topside Protection

mail this coupon today

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☐ Please send sample of Glasfab.

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Name:_____ Title:_____

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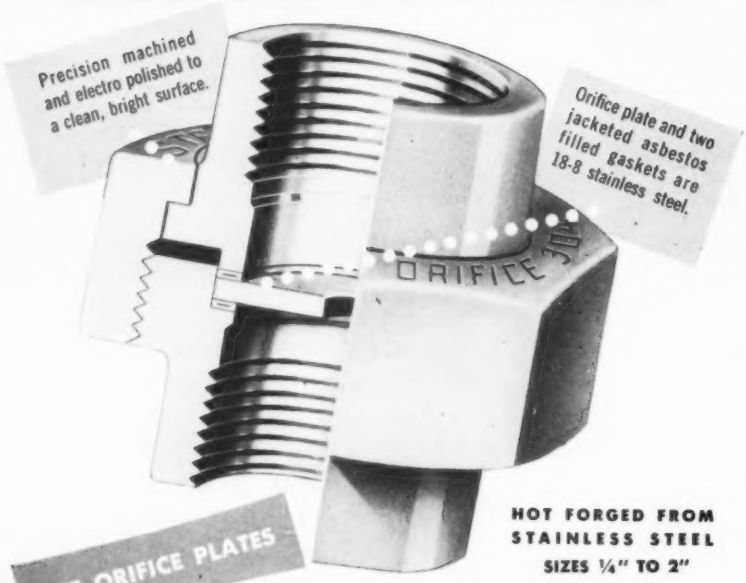
designed and built . . .
for top performance on all metering, measuring and flow control services.

STAINLESS STEEL
ORIFICE 304
STAINLESS STEEL
ORIFICE 304 DUAL


Precision machined and electro polished to a clean, bright surface.
Orifice plate and two jacketed asbestos filled gaskets are 18-8 stainless steel.
ORIFICE 304

THE ORIFICE PLATES

HOT FORGED FROM STAINLESS STEEL
SIZES ¼" TO 2"

and gaskets are set in a groove of solid stainless steel to facilitate tightening and safeguard against blowing of gaskets. Plates drilled to specification or perforated for use as strainer union. Solid plates can be used for blanking off.

ORIFICE 304 unions are all stainless steel (Type 304) with recommended working pressures of 3000 pounds at 250° F. on services where stainless steel is required. Type 316 and 347 stainless steel ORIFICE unions are also available.

ORIFICE 304 DUAL is our trade name for unions with stainless steel ends, gaskets and plates and carbon steel (Udylited) nuts. Available with Type 304, 316 or 347 stainless steel and recommended for service where atmospheric corrosion is not a problem.

C. M. & CO. ORIFICE forged steel unions have, for years, been recognized as leaders among all orifice unions for outstanding dependable service.

WRITE DEPARTMENT "C" FOR ILLUSTRATED LITERATURE

ORDER BY TRADE NAME FROM YOUR LOCAL SUPPLY STORE

ORIGINATORS AND PIONEERS OF STEEL UNIONS SINCE 1912
CLAYTON MARK & COMPANY
1900 DEMPSTER STREET • EVANSTON, ILLINOIS

For more facts circle 629 on Reply Card

serviceman—tell him where and what was seen.

4. See that dogs, pets and children are kept out of plant buildings where rat control is being carried out (unless constantly on leash or in hand); they could eat or drink something containing poison.

What an Exterminator Can Do

1. It takes special equipment to handle poisons.

2. It takes a specially trained man, who is not only schooled for, but who is handling problems daily under field conditions. He can recognize unusual kinds of infestation.

3. He has the newer insecticides and is up-to-date on methods.

What Exterminator Service Man Can Do

1. The exterminator service man should maintain good public relations with cleaning men and women. (A friendly greeting is sufficient; it isn't necessary to engage in long conversations.) If they know the exterminator they will point out trouble spots.

2. Exterminator man can check natural breeding spots—not cleaned (such as bottom of garbage cans for maggots—and other neglected or overlooked areas) and point them out.

3. He may vary the poison, the method of application. When necessary, informing the department head. For example, if a restaurant or kitchen floor is mopped or hosed out every night, the materials used in controlling mice and rats will be washed out, also. Again, in rat control, apple cores may be used as a base for poison, and strategic trapping also employed—to get the last ten or last two. Methods and application may have to be discussed with section head.

Points to Check in Selecting Exterminator Service

1. Be sure exterminator carries enough insurance to cover any accident or claim—so that your plant or company is protected from lawsuits.

2. Exterminator should have a laboratory or buy from a manufacturer who has one to test solutions to unusual problems.

3. Exterminator should have adequate and modern equipment as well as skilled and experienced personnel.

4. It is usually a good sign when a company belongs to its national association (The National Pest Control Association.)

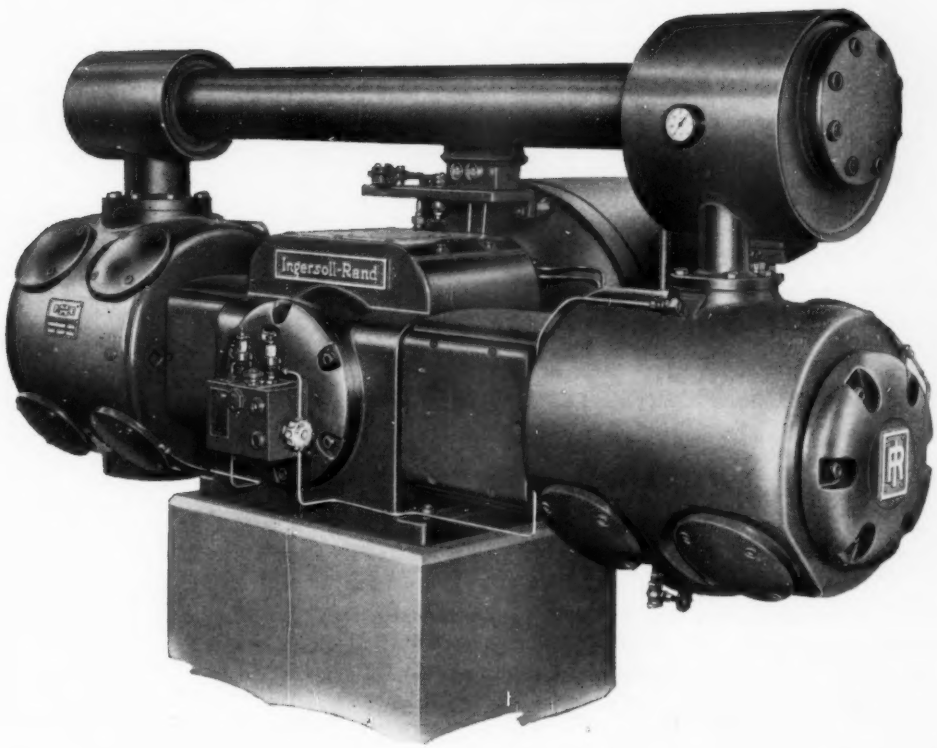
5. The lowest bidder is not necessarily the contractor who will do the job at lowest cost.

NEW

OPPOSED-CYLINDER

BALANCED DESIGN, TYPE PHE

COMPRESSOR



COMPACT, SPACE-SAVING PACKAGED DESIGN

The new, space-saving PHE design marks another Ingersoll-Rand achievement in electric-driven compressors. Built for continuous, heavy-duty service, it includes the following outstanding features: Opposed pistons with excellent running balance — Efficient tube-type intercooler—New cylinders with Type A Channel Valves—Motor mounted directly on crankshaft—Full floating aluminum main and crank-pin bearings — Sealed crankcase — Force-feed lubrication.

FOR EASY SHIPMENT, INSTALLATION & RELOCATION

Shipped completely assembled and ready to run, the PHE compressor can be easily installed—in very little floor space—with a minimum of piping—and on a simple inexpensive foundation. Relocation, if required, is equally simple.

ELECTRIC-DRIVEN 75 AND 100 HP SIZES

The basic design is a two-stage unit for 80-125 psi. For other pressures, or for pumping vacuums, alternate cylinder arrangements can be supplied. It will pay you to get all the facts on this new, cost-saving design. Ask for Bulletin No. 3155.

Ingersoll-Rand

1-106 11 Broadway, New York 4, N. Y.

COMPRESSORS • AIR TOOLS • ROCK DRILLS • TURBO BLOWERS • CONDENSERS • CENTRIFUGAL PUMPS • DIESEL AND GAS ENGINES

For more facts circle 630 on Reply Card

COME TO PHILADELPHIA

Dec. 2-3-4-6-7 1954

21st NATIONAL POWER SHOW

NATIONAL EXPOSITION OF POWER AND MECHANICAL ENGINEERING

COMMERCIAL MUSEUM — PHILADELPHIA

LEARN HOW YOU CAN MODERNIZE POWER FACILITIES

Concentrated under one roof you will see the newest improvements and refinements in power generation, transmission, utilization. Learn how these methods will help to modernize your power facilities—

The latest techniques for the maximum development and most economical utilization of power will be demonstrated by the skilled technicians manning every booth. Whether you are interested in mechanical, steam, electrical, hydraulic or pneumatic power, you will be sure to find ideas that will repay you many times over.

When going to the A.S.M.E. meetings, be sure to plan a stop-over at Philadelphia to see the Power Show.

PLAN NOW TO ATTEND

Write early for hotel reservations and advance registration.

Under the auspices of the ASME

Management: International Exposition Co., 480 Lexington Ave., New York 17, N. Y.

For more facts circle 631 on Reply Card

Safety Organization With Electrical Hazards

(Continued from page 116)

The widespread use throughout factories and laboratories of equipment operating at voltages below 750 volts renders it impractical to make all circuits and apparatus 100 per cent "fool proof."

A good rule is to attempt to make all equipment "dead front" insofar as possible, containing all live parts within steel insulating housings. Figures 1 and 2 are typical examples of such equipment. Such equipment may often be made the equivalent of "dead front" by placing a barrier of transparent compound between the tester and live terminals, making required adjustments by the use of special insulated tools inserted through small holes drilled in the barrier.

Many types of apparatus must be given high voltage insulation tests before shipment. It is often not practical to remove the apparatus to enclosed test areas or to surround it with enclosures or barriers to prevent access during testing. The voltages used in such tests, while usually 40,000 or less, sometimes run as high as 100,000 volts and are obviously lethal.

Testing transformers are usually moved adjacent to apparatus under test.

The problem here is to provide practical means of assuring that all personnel are clear of the apparatus and test connections and effectively prevented from entering dangerous areas.

A method which has been found very effective over a long period is outlined from the Safety Rule Book as follows:

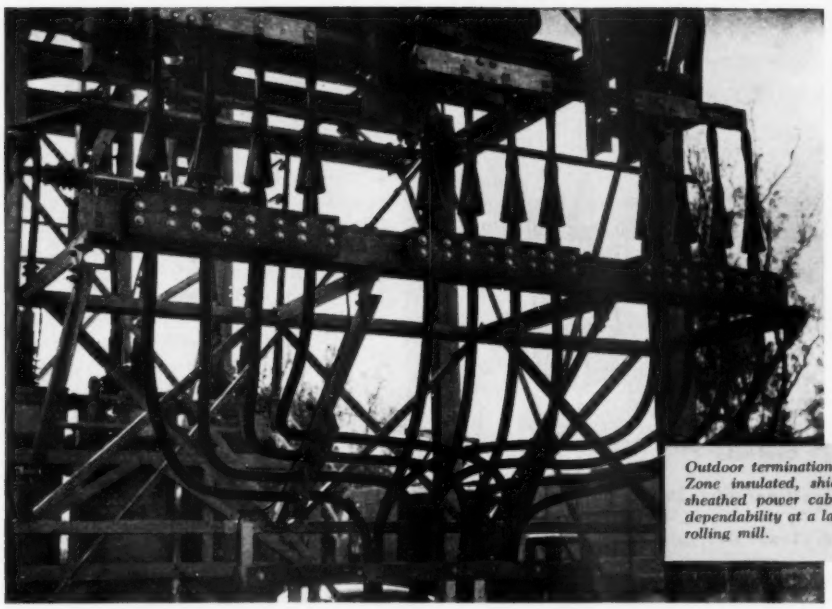
1. Perform all such testing under the direction of experienced technical personnel, especially trained in the conduct of such tests.

2. Enclose the area from which personnel must be excluded with white tape having a red marker stripe. School all assemblers and other personnel likely to be in the vicinity to know the meaning of the "white tape" and that for their own protection they must keep clear of it.

3. Locate the test control apparatus where the operator has full view of the enclosed area.

4. Where the area or the apparatus is so large that the operator cannot see all enclosed areas where personnel might enter, station one or more assistants in view of such areas and the operator. Provide these assistants with foot switches which must be depressed to permit application of test voltage and which, when released will remove test voltage.

5. Station helpers around the area to act as guards to prevent anyone



Outdoor terminations of Rome RoZone insulated, shielded, RoPrene sheathed power cable installed for dependability at a large West Coast rolling mill.

Here's a cable installation no one is worrying about . . . *and here's why*

Cable may be only a small part of modernization costs... but without *reliable* cable that is *right* for the job, even electronic brains become muddled... can't deliver what you paid for. The installation shown is a case in point—they used the *best* because "It costs *less* to buy the best," RoZone-RoPrene for example. Here's what makes it *best*:

RoZone Insulation

The comparative photos (right) show the high degree of RoZone's resistance to ozone cutting and corona, as a high-voltage insulation. It has remarkable stability in water, which means you can bury it directly in the ground.

These and other properties of this premium-quality, oil-base compound add up to the long life—reliability—you need. Install it and forget it! Special tests assure you of *consistent quality*.

Every foot of Rome cable rated at 3,000 volts and over is subjected to corona level testing in our specially designed ionization detector.

RoPrene Sheath

This is a tough, weather-resistant, nonmetallic Neoprene sheath, with excellent aging characteristics. It offers you high resistance to acids, alkalies, oils, greases, moisture, heat, sunlight, and flame. RoPrene gives you distinct handling and weight advantages over lead sheath . . . and at less cost.

RoZone premium insulation with tough RoPrene sheath make an unbeatable combination for steel, paper and textile mills, refineries, chemical plants and other industrial installations. RoZone-RoPrene!

Two unretouched photos showing (left) surface cracking after short time ozone test on conventional rubber specimen and (right) undamaged RoZone specimen after long-time ozone test.

Trouble . . . ionization, caused by electrical breakdown of air in pockets, will attack insulations and can cause premature cable breakdown. Our corona level testing eliminates this danger.

* * *

You will find complete information on RoZone-RoPrene and other Rome cables in this catalog. Send for it today—we believe it will help you.

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and
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National Electrical Week, October 18-25

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Please send me a copy of the Rome "Power and Control Cable Catalog."

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Check today with your ACCO *Registered* distributor, or write to our Wilkes-Barre, Pa., office for our **S-2** Sling folder. Remember—if it's ACCO *Registered*, it's SAFE.

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For Better Value

For more facts circle 633 on Reply Card

from approaching the danger zone.

6. Enclose the testing equipment in a substantially grounded metal enclosure and place a flashing red light and a "Danger—High Voltage" sign adjacent to it and at remote extremities of large taped-off areas.

7. Where high voltage cable must traverse un-enclosed area between the test equipment and the apparatus under test it must have a substantially grounded metal sheath.

Figure 3 illustrates a typical set-up for a test of this type. To be sure, the strip of tape is a flimsy thing and is no physical preventative to a man who might choose to crawl under it or go beyond where it is put up. It is not fool proof. Neither is a red traffic

"Memo from Engineering. What happened—didya botch a job?"

light any physical barrier to the motorist and it is not fool proof. However, this company has no record that anyone was ever injured during conduct of such hi-pot tests.

The need for a coordinated safety program is apparent for without it the efforts of individuals and groups are certain to be erratic and many items will be by-passed or overlooked. The following framework is suggested for building such a program.

1. Department or Plant Administrator

Appoint an administrator whose duty it shall be to coordinate the safety activities of the several groups in the plant, initiate necessary action to implement conformity to established safety rules, and keep top management fully informed on matters of safety. The administrator should be of higher rank than the Test or Laboratory Foreman in charge of actual testing so that he may have authority to initiate prompt action.

2. Determination of Safe Practices to be Followed

If a Safety Rule Book has been

you'll get the same reading Ten Years from today

Read "behind" this vacuum gauge, and you'll see that Dunham Vacuum Heating Pumps perform as rated year after year, in properly installed and serviced systems, without expensive repairs—at low amperage. That's because there are *no close clearance adjustments* needed to maintain full capacity. Impeller is only principal moving part.

Dunham gives you a pump "package" too. No "extras" to buy! All standard units have controls mounted and wired. Duplex Pumps have mechanical alternator.

Low level inlet connections simplify installation. No vacuum on stuffing boxes. All important parts readily accessible. For full information, mail coupon.

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Single and Duplex models for capacities from 2,500 through 65,000 EDR

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Please send your new Pump Bulletin just off press.

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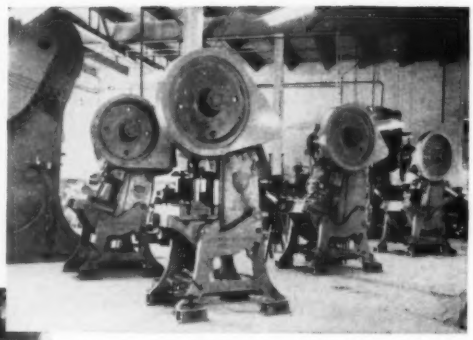
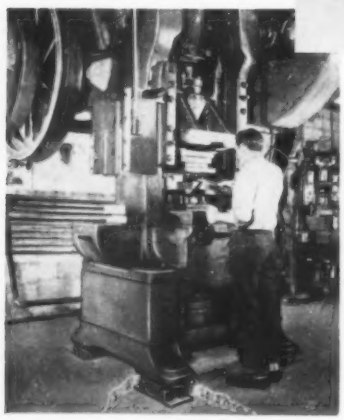
To PREVENT VIBRATION trouble later...

...See KORFUND NOW!



→ Korfund Steel Spring Vibro-Isolators installed without bolting to the floor under these presses at Wells Specialty Company, Inc., North Liberty, Indiana, permit rapid rearrangement of production lines. Effective Korfund Vibration Control also permits press operation at considerably higher than rated speeds without vibration—something the simple felt pads previously used by Wells Specialty Company could not do. (Since the 200 ton press at left requires a pit for its pneumatic cylinder, the Vibro Isolators are installed below floor level.)



← A Four-Time Loser! After four different schemes for controlling vibration of their 180 ton capacity press were tried at a cost of well over $1,000.00, without success, Sterling Industries Inc., Philadelphia, called in their local Korfund representative. Four standard Korfund Steel Spring Vibro-Isolators installed directly under the press solved the problem. Total cost—$332.00.

ALL KORFUND STEEL SPRING VIBRO-ISOLATORS HAVE ADJUSTABLE LEVELING BOLTS...A KORFUND FEATURE FOR OVER 30 YEARS!

When dishes rattle and plaster cracks in homes near your plant, as happened in the two cases described above, you know your vibration control equipment is not effective. Usually your neighbor's attorneys will suggest you do something about it. Many problems such as this, as well as those involving interference with precision machinery in the plant, damage to the building structure or the press itself, etc., are brought to Korfund for solution.

We usually find the trouble lies in depending on one type of Isolator to do the job. We believe one product or even one type of product cannot solve all vibration problems efficiently and economically. We make several different types—each one designed for a particular set of conditions.

That's why when you bring your vibration problem to Korfund, you get our impartial recommendation on isolation media whether it be springs, rubber, or cork—alone, or in combination. We have all three—we favor none. Our only interest is your satisfaction.

For your free equipment isolation Selector Chart and additional data on increasing production and reducing costs, write for copy of Bulletin 21, or see our catalogue in Sweet's Files.

For specific recommendations, contact us or your local Korfund office. A half century of experience is at your disposal.

THE KORFUND CO., INC.

KORFUND VIBRATION CONTROL — SPRINGS — RUBBER — CORK

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In Canada: 510 Canal Bank, Ville St. Pierre, Montreal

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established by a company-wide authority it should become the minimum basis for all Departmental or Plant Safety activities. Otherwise establish a Safety Committee under the chairmanship of the Administrator and consisting of foremen of the different groups engaged in testing. The primary functions of this committee are to prepare and maintain the Rule Book, study conditions, analyze the cause of accidents and near accidents, supervise the design of testing equipment and conduct safety inspection.

3. Vehicle for Carrying out the Program

Establish an Electrical Safety Sub-Committee under the chairmanship of each foreman which should meet regularly at monthly intervals to discuss all matters of safety relating to operations in the foreman's group. At least three of the members should be non-supervisory employees. A secretary should be designated to record each item discussed and transmit reports of each meeting to the Administrator and other appropriate members of management. Each item should be carried on the Sub-committee's agenda until satisfactorily disposed of.

4. Unit Programs

To meet Rule Book specifications a program should be set up by each Sub-committee man to periodically instruct people, inspect installations, scrutinize practices, take care of maintenance, make reports of accidents and near accidents, etc.

5. Inter-Departmental Inspection Committee

Establish an inter-departmental system of inspections to be made each three months by a committee (consisting of men similar in rank to the administrator). Copies of the minutes of the committee should go to the Manager of Manufacturing in each department thus inspected.

6. Personnel Involved in Electrical Safety Program

Testers, electrical maintenance men, engineers and laboratory assistants with duties where electrical hazards beyond those of normal shop operations are present should be covered in this Safety Program. Other crafts may be included as desired.

A suggestion of controls is carried in this program in that copies of reports are to go to members of top management. Details of course will be arranged to suit the needs in each case. The important thing is that top management, from the general manager down, require sufficient reports to keep informed about safety activities. Without such control, the searching inquiry following a fatality may unearth oversights about which higher management had no information.

"...now—I can handle light or heavy loads easier, smoother and with greater accuracy."

It's true . . . any crane operator can do a more efficient job with Whiting's new magnetic Selectodyne hoist control. Having eleven instead of the conventional five speed selection points, Selectodyne permits precision handling of any load . . . light *or* heavy. Selectodyne provides *easier, smoother* load handling at speeds that assure the utmost in safe, sure crane control. Simple in design, trouble-free in operation, Selectodyne is another reason why Whiting Engineered Cranes perform better at lower cost!

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Gives complete information on the advantages of this remarkable new control. Write for your copy today!

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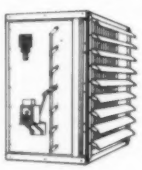
Is this the way your plant gets its MAKE-UP AIR ?

IF SO, YOU NEED

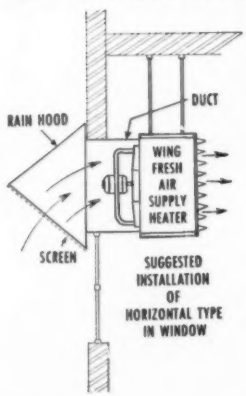
WING FRESH AIR SUPPLY HEATERS

WHEN air is exhausted from paint spray booths or other plant operations, it must be replaced. If no other means are employed, it rushes back through opened doors or windows, or seeps back through cracks and crevices. Your exhaust fans can't work properly or efficiently and your heating system is nullified. WING FRESH AIR SUPPLY HEATERS are the answer. They supply make-up air properly heated, they require no expensive duct work and the coils cannot freeze, regardless of weather, because full steam pressure is on at all times.



HORIZONTAL TYPE WING FRESH AIR SUPPLY HEATER

Write for complete information



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OUR 75TH YEAR 1879

Wing

SEVENTY-FIVE YEARS AGO

Demonstrating the new Edison phonograph. This simple hand-cranked machine, invented in 1877, was soon to be in every home, doing for sound what the invention of printing had done for literature. In 1879, L. J. Wing, another talented inventor of that period, was designing and building fans, steam engines and electric motors, which won many awards for the L. J. Wing Mfg. Co., today celebrating its 75th anniversary.

For more facts circle 637 on Reply Card

Boston Plant Engineers

(Continued from page 142)

Boston Club has an employment committee, headed by Howard B. Bent, Lynn Gas & Electric Co. If the men hear of any possible opening, they inform Mr. Bent, and he, in turn, sends notices to those men who may be looking for a new position.

Every June meeting is the annual outing. No speaker is planned for this meeting, instead golf, bowling, games and refreshment are the order of the day.

The final affair of the evening consisted of presenting door prizes to each member and guest.

Each year, the Club also holds a raffle and the money collected is given to one of the local charities. Although this year's prize—complete tiling of kitchen floor, donated by Bird & Son, Inc.—was won by Otto Beuttel, Braman-Dow & Co., he asked that the prize be auctioned off to the highest bidder. The Club received $41.50 from the auction to add to the original raffle collection of $64, for a total of $105.50. This amount was donated to the Jimmy Fund, a local infantile paralysis charity. The annual outing was attended by 52 members, 37 guests.

Oil Refinery Turnaround

(Continued from page 121)

Mechanical Superintendent and then a head of maintenance and planning.

Under the head of maintenance and planning comes the crafts: Pipe Department, Fire Department, Machine Shop, Electric, Instrument, Boilermakers, Welders, Riggers, Laborers, Masons, Insulators, Painters, Carpenters and Storehouse.

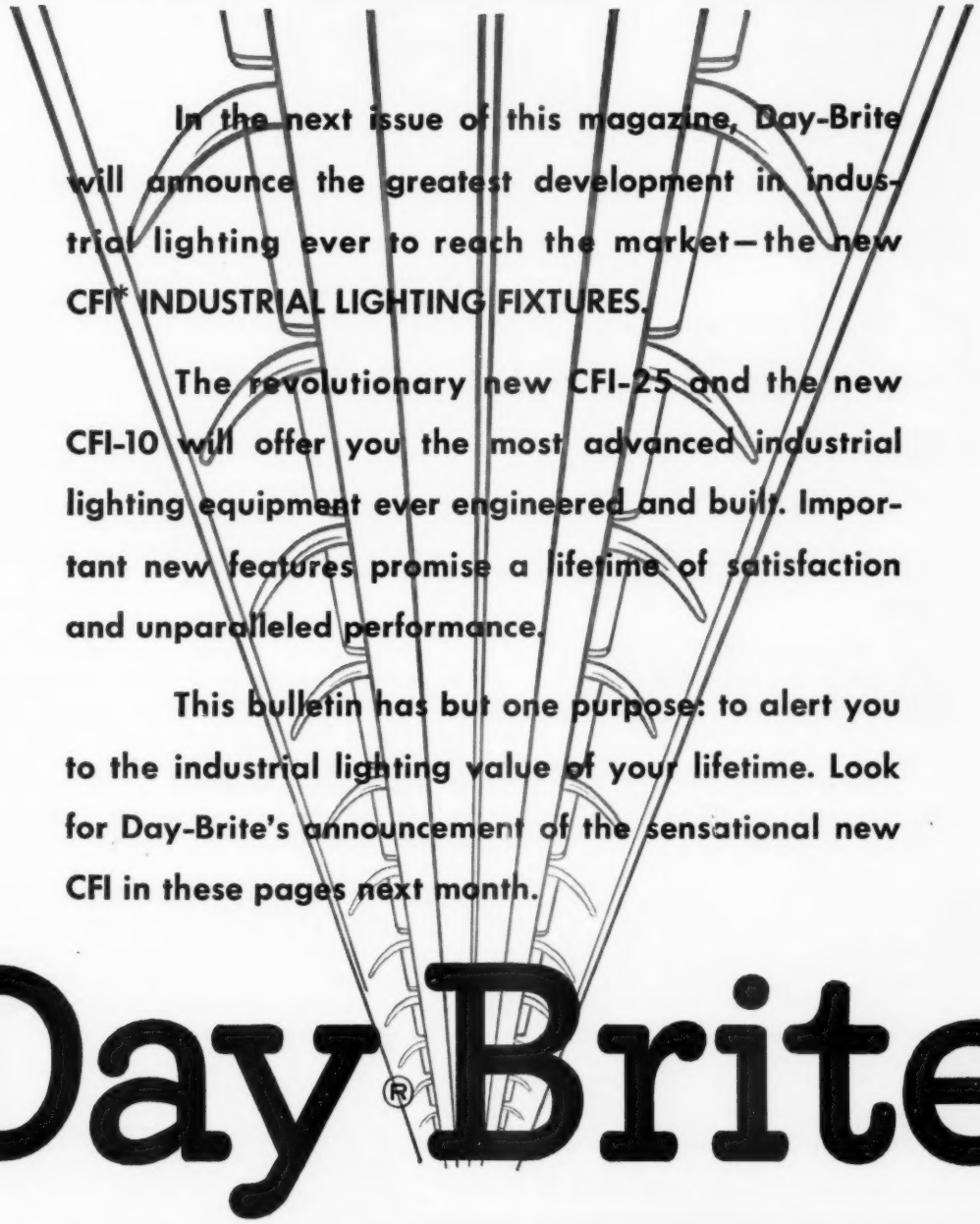
Under the Assistant Mechanical Superintendent comes, in addition to the above, the Engineering Department, the Materials Inspection Department, a construction man and a civil engineer. Both our construction and maintenance is centralized. At one time we had area maintenance but dropped it because of manpower inefficiency.

Work to be done in any area or unit must be written on a mechanical order form, approved by the area or unit head and forwarded to the Mechanical Department office. Men will then be assigned to do the work.

In between turnarounds, the assignment of men to these mechanical orders and to construction is done at a daily 3 o'clock meeting.

To give you an idea of the magnitude of mechanical operations at the Everett Refinery the plant investment per mechanical department man is $78,307.00.

Bulletin



In the next issue of this magazine, Day-Brite will announce the greatest development in industrial lighting ever to reach the market—the new CFI* INDUSTRIAL LIGHTING FIXTURES.

The revolutionary new CFI-25 and the new CFI-10 will offer you the most advanced industrial lighting equipment ever engineered and built. Important new features promise a lifetime of satisfaction and unparalleled performance.

This bulletin has but one purpose: to alert you to the industrial lighting value of your lifetime. Look for Day-Brite's announcement of the sensational new CFI in these pages next month.

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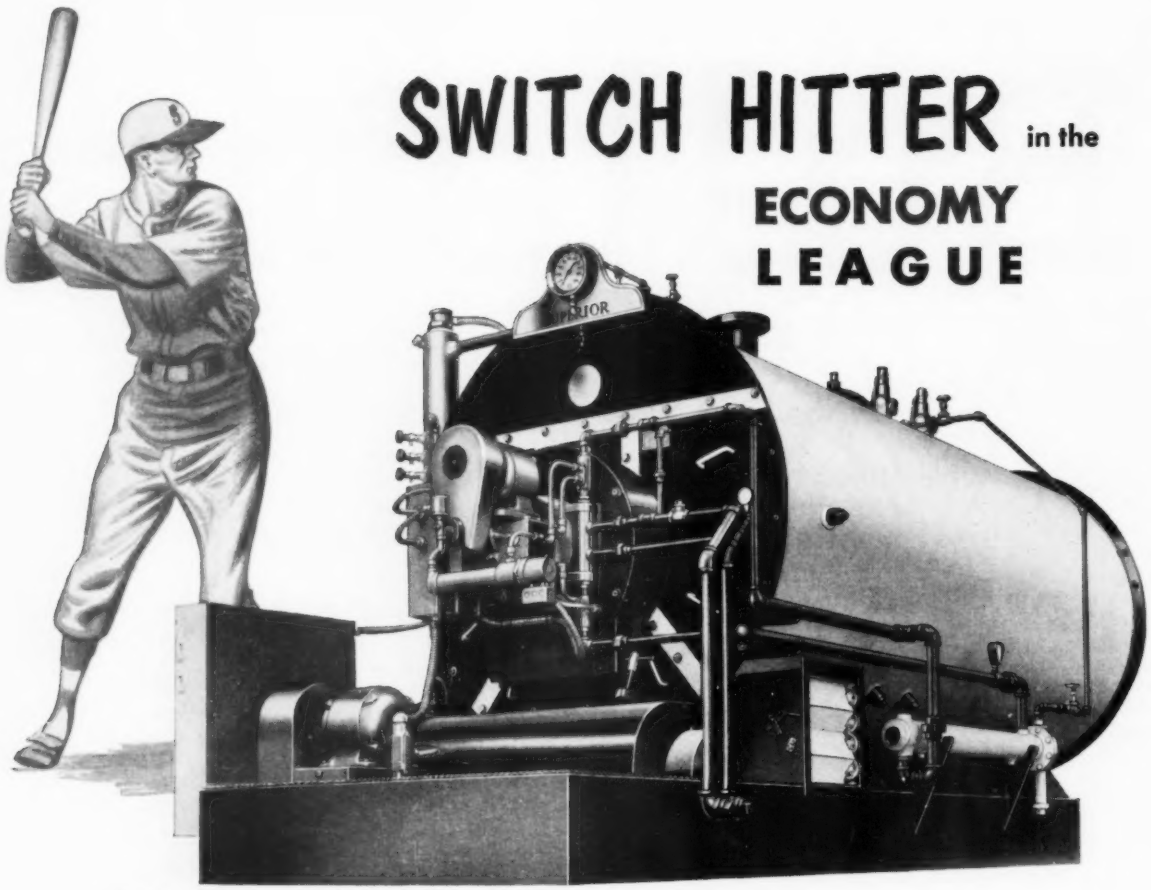
SWITCH HITTER in the ECONOMY LEAGUE



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STEAM GENERATORS

Just as the switch hitter changes his batting stance to take full advantage of the pitching situation, Superior Steam Generators change fuels to take advantage of the price situation. When equipped with combination gas/oil burners, Superior Steam Generators switch from one fuel to the other quickly, and without dismantling the equipment or interrupting the steam supply.

Superior Steam Generators are completely factory-assembled and fully tested prior to shipment for guaranteed performance exceeding 80% thermal efficiency, fully automatic . . . burning oil or gas . . . and are available in 18 sizes from 20 to 600 b.h.p. for pressures to 250 p.s.i. or for hot water. For complete details write for catalog 505-F.

for performance you can **BANK** *on*

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TIMES TOWER, TIMES SQUARE, NEW YORK 36, N.Y.

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STEAM GENERATORS

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BULLETINS

(Begins on page 23)

160 **Meters, Controls**—Meters and controls, including transmitters, indicators and recorders are described and illustrated in the 16-pp new edition of company's Bulletin 17. Gives specifications for measuring, receiving, controlling 18 variables found in production processes. Bailey Meter Co.

161 **Flow Meters**—Bulletin 1052 gives design features, maximum flow capacities, maintenance requirements and mounting drawings of a new compact, low cost multiple stage flowmeter, primarily designed for automotive, aircraft, chemical and petroleum industries. Includes full size sections of individually graduated 18 in. logarithmic scales, view of "inner wall" guides and complete flow range chart. Commercial Research Laboratories, Inc.

162 **Flow Indicator**—Bulletin 190, 8 pp, describes company's Flow-Mizer, a low-cost, single or multi-tube flow indicator, designed for accurate measuring of non-corrosive liquids and gases at moderate pressures. Includes construction details, dimension drawings, capacity charts. Brooks Rotameter Co.

163 **Dall Flow Tubes**—Sixteen-pp of engineering information on Dall flow tubes are provided in illustrated Technical Bulletin 115-L3. Discusses this metering device from the standpoint of construction, applications, special features. Includes data on working pressures, capacities, accuracy. Also tells installation requirements. Builders-Providence, Inc.

164 **Elements for Control Systems**—Company's Telesyn units and systems for accurate transmission of shaft rotation values and voltage magnitude patterns are described in a 20-pp bulletin. Describes, gives dimensions on generators and motors for transmitting angular positions, control transformers for voltage indication and servo control, others. Ford Instrument Co., Div., The Sperry Corp.

165 **Hydraulic, Pneumatic Controls**—Catalog 4G, 34 pp, describes, illustrates Shear-Seal principle and its application in manual and solenoid valves. Chart shows how to select proper pressure switch. Barksdale Valves.

To order these bulletins circle item numbers on the handy Reader Service Cards provided on the facing page.

166 **Hardness Tester**—Catalog DH-114, 12 pp, gives, in four sections, engineering, data, uses, design features of a line of Rockwell hardness testers. Discusses applications in industry, data on normal hardness tester, superficial tester, micro and macro hardness testers. Wilson Mechanical Instrument Div., American Chain & Cable Co., Inc.

167 **Crane Controls**—Bulletin GEA-6112, 20 pp, describes a new line of a-c crane controls, emphasizing application, installation and selection. Illustrations include speed-load charts, circuit diagrams and installation photos. General Electric Co.

PACKINGS, GASKETS, SEALS

168 **Braided Packing**—Illustrated 8-pp Bulletin A-131 describes manufacturer's Lattice Braid rod and shaft packings. Points out construction features, and discusses available materials, sizes and forms. Also contains service reports from users, and includes service recommendations. The Garlock Packing Co.

169 **Role of Flange Surfaces**—"How Flange Surfaces Affect Gasket Sealability and Joint Performance," is a 24-pp booklet, the latest in a series under the collective of "The Gasket." This most recent bulletin provides a basis upon which to select the flange surface finish most suitable for a given gasket. Explains why the right finish makes it easy to achieve an initial seal and obtain best joint performance. Johns-Manville.

170 **O-Rings**—This 24-pp product catalog lists company's standard size commercial, fuel-resistant, oil-resistant O-Rings. Gives engineering and design information, service recommendations, dimensional data, test reports. Stillman Rubber Co.

TOOLS, WELDING AND MACHINE SHOP EQUIPMENT

171 **Tools that Save Time**—Presented in 8-pp Catalog M.C. 402 are counter bores; a "handy angle" saw that will work on ¼-in. electric drills, air drills or flexible shafts; an angle head for use with ½-in. electric drill; machine bits; and carbide-tipped trimmers, cutters and router bits. Fully illustrated; brief text covers applications for the tools, pointing out mounting flexibility, features. Price & Rutzebeck.

172 **Twist Drill Application Chart**—This chart gives recommendations on the kind of drill to use in practically all types of metals and materials. Illustrates six types of jobber's drills, also short length screw machine and power drills, others. Shows drill points for various materials, speeds and feeds, recommended oils, etc. Whitman & Barnes.

173 **Tools for Woodworking**—Catalog 35-H, 14 pp, covers a line of hand tools for woodworkers. Describes, illustrates all company's auger bits and drills, bit sets in plastic rolls, bell hanger's drill, chisel sets in various containers, socket chisels. Greenlee Tool Co.

174 **Hand Torches**—Catalog ADC 702B, 36 pp, describes, pictures company's complete line of torches and tips for oxyacetylene cutting and welding. Lists necessary mixers, extensions, adapters, accessories used with torches. Includes cutting, welding pressure charts. Air Reduction Sales Co.

175 **Design, Welding Engineering**—This handy pocket-size 16-pp manual discusses low temperature Eutectic welding alloys, giving technology, nomenclature, design information. Diagrams some typical applications. Eutectic Welding Alloys Corp.

176 **Spindle Bearings for Grinding Wheels**—Attractively illustrated in color, Publication G-604, 16 pp, makes use of clear plastic overlays to show various design details of Filmatic grinding wheel spindle bearings. Explains how Filmatic provides rigidity and low friction in conventional and modified plain bearings. Cincinnati Grinders, Inc.

177 **Diamond Grinding Wheels**—Catalog 55, 44 pp, describes company's Jetaline and RoBot Resin diamond grinding wheels. Gives wheel facts and application, operation, explains type designations and symbols used for ordering, tables give specifications on each type. Action Diamond Tool Co.

178 **For Abrasive Savings**—How this company's steel shot lowers cleaning and peening costs is explained in Bulletin 89-A, 8 pp. Lists 19 control checks. American Wheelabrator & Equipment Corp.

OTHER EQUIPMENT

179 **Bulk Storage Tanks**—How company's bulk storage tanks serve many industries is told in this handsomely illustrated 28-pp booklet. Dimensions and capacity data are given for standard horizontal and vertical tanks and those for underground storage. Many installations are pictured, and manufacturer's plant facilities are described in detail. Graver Tank & Mfg. Co., Inc.

180 **Industrial Turbines**—Mechanical drive turbines rated from 10 to 1200 hp and 1000 to 6500 rpm are described in a revised bulletin, GEA-4955B, 20 pp. Design features as well as applications for pumps, compressors, fans, blowers and other equipment are covered. Generously illustrated, this booklet gives details of the lubrication system, dimensions, procedure for calculating approximate steam rates, and governing system. General Electric Co.

181 **Submerged Combustion Equipment**—This 18-pp application manual tells where and how to use submerged combustion equipment in various industries. Discusses such applications as concentration of corrosive solutions, heating and oxidizing of asphalt, generation of inflammable gases by cracking recycled stock, and heating large volumes of water. Additions and supplements to manual will be mailed to plant engineers receiving this manual. Submerged Combustion Co. of America, Inc.

182 **Rubber Products**—Catalog 25-C is a 24-pp new edition of this company's catalog on industrial rubber products. Covers V-belts, transmission belts, conveyor belts, all types of hose, molded products. Provides information on such new products as the Poly-V-drive designed to combine the simplicity of flat belts and grip of V-belts. Product and installation photos illustrate this booklet and the condensed text is organized for quick reference. Manhattan Rubber Div., Raybestos-Manhattan, Inc.

Safety Suggestions

183 **Hand Saver**—A power press safety control—in which the only equipment worn by the operator are leather wristbands containing harmless amounts of radioactivity—is described and pictured in this bulletin. Explains simplicity, greater protection afforded, easy installation of this radioactive guard. Illustrates control box, Geiger tube detectors, wristbands. Hazatrol Corp.

184 **Industrial Truck Safety** — This folder, "Send Your Cowboys to School," gives pictorially the do's and don'ts for safe industrial truck operation. The Elwell-Parker Electric Co.

185 **High Cost of Accidents**—This attractively illustrated booklet, 8 pp, is intended for small firms with few employees and no safety staff. Tells how accidents cut profits and outlines "why" and "how" of accident control. National Safety Council.

186 **Industrial Equipment**—Catalog G-4, 32 pp, covers this manufacturer's line of ball-bearing swivel joints as well as other products including loading racks, manifolding lines, all-metal hose, and flexible aircraft assemblies. In addition to providing dimensional and operating data on these products, this booklet is generously illustrated. Chiksan Co.

187 **What and When of Weldless Chain**—Bulletin D, 8 pp, defines weldless chain, explains use and tells how it differs from formed wire chain. Details link construction used in making of chain, describes and illustrates various chains. The McKay Co.

188 **Air Filters**—Bulletin 54-500, 14 pp, lists six cost saving features of compressed air line equipment. Describes, illustrates plastic bowl-filters, lubricators, regulators. Tables show dollars and cents value of wastage, number of branch pipes. Breco Mfg. Co., Inc.

189 **"Dag" Dispersions at Work** — How "dag" colloidal dispersions serve industry is told in 12-pp illustrated Catalog 460. A table lists 40 basic dispersions of graphite, molybdenum disulfide, vermiculite, and zinc oxide in various carriers. Comparative particle size and consistency of each dispersion is given, as well as typical uses. Acheson Colloids Co.

190 **Vapor Degreasing Do's and Don'ts**—This 24-pp, well-illustrated, manual shows proper degreaser operating methods. Covers every phase of metal cleaning through vapor degreasing including safety, correct layout and maintenance of equipment. Illustrations show methods. Manufacturers Processing Co.

191 **Cupolas**—New developments in cupola design and manufacture, analyses of various hot blast systems, and specifications are given in Bulletin FY-172, 24 pp, to mark manufacturer's 70th anniversary. Whiting Corp.

192 **Water Hose**—Bulletin F.3351-E254, 8 pp, describes and illustrates company's water and water suction hose. Lists specifications for each type as to size, weight, construction, recommended use and working pressures. Boston Woven Hose & Rubber Co.

DATA FILE of literature for the plant engineer's library

STANDARD CATALOGS, bulletins and handbooks are listed to help plant engineers maintain a permanent data file. To get these free catalogs, circle item numbers of those wanted on postage-free cards provided for you on pages 215-216.

MAINTENANCE

201 **Basic Roofing Information**—"What You Should Know About Your Roof" is a 40-pp, clearly illustrated booklet which tells what makes a roof fail, how to recognize signs of roof deterioration, what to do to keep a roof in good condition. Discusses recommended roofing practices, essentials of a good re-roofing job, also special features of company's roofing materials. Johns-Manville.

202 **Tar Base Coatings**—Now available is a collection of five bulletins on company's 100 series of cold applied tar base coatings. One bulletin gives general information on the full line and provides an application chart. The others give detailed specifications and application information on the various types. These include a coating for protection against severest corrosive conditions; a thin high gloss coating for general maintaining purposes; a coating for protection against generally severe corrosive conditions; and one for water tank interiors. Pittsburgh Coke & Chemical Co.

203 **Guide to Rust Prevention**—The 24-pp 1954 edition of this company's general catalog provides a treatise on rust prevention. Features 94 color chips of manufacturer's products and includes instructions for surface preparation and application of primers, short- and long-oil types, machinery and implement finishes, chemical and heat resistant types, sealers, oil field finishes, thinning oils and floor and masonry coatings. Presents a restful color group of finishes for plant interiors; also describes special finishes. Rust-Oleum Corp.

204 **Painting with Aluminum**—Again made available to plant engineers is Form AD-228, 32 pp, on the use of aluminum paint. Discusses advantages of aluminum paints, describes three basic types for non-absorbent surfaces for weather-exposed wood, and for heated surfaces and those not exposed to weather. Typical maintenance applications are covered in text and picture and practical suggestions for good results included. Use of aluminum paint on steel, galvanized metal, wood, masonry is detailed. Aluminum Company of America.

205 **Protective Paints**—Details on a rubber-base paint formulated to afford increased protection against corrosion from acids and alkalis, and especially applicable for use on concrete, are provided in this literature. These finishes are also suggested for wood and metal surfaces. Cellulose Products Dept., Hercules Powder Co.

206 **Hot-Dip Galvanizing** — How hot-dip galvanizing is prolonging life of industrial equipment is stressed in this 16-pp booklet. Photos showing galvanized equipment in use accompany brief text explaining how this process of covering iron and steel with a protective coating of zinc serves to prevent rust. The galvanizing procedure is explained and illustrated. Coating comparison charts show how hot-dip galvanizing compares with other types of coatings as to rust resistance, dimension limits, shock resistance, initial and maintenance costs. American Hot-Dip Galvanizers Assn., Inc.

207 **Corrosion Protection Data**—A detailed study of the performance of various protective coating systems, this bulletin gives test data on 11 coating systems exposed up to 83 weeks in hydrochloric acid atmosphere. Illustrated with photos, includes corrosion-failure time comparison chart. Gates Engineering Co.

208 **Blower-Suction Cleaner** — Data on a portable combination blower suction cleaner for cleaning machinery motors, stock bins are offered. Describes models available, attachments for a wide range of cleaning jobs. Clements Mfg. Co.

209 **Building Maintenance** — Handbook 7 offers 64 pp of information on floor surfacing, leak stoppers, external wall sealants, road patching, roofing materials. Includes instruction for use. Flexrock Co.

210 **Vacuum Cleaning Equipment**—Vacuum cleaning units to suit requirements for commercial buildings, industrial plants and buildings where noise is objectionable are listed in illustrated bulletin 152. Also shown are furnace cleaners, units for emptying sump tanks, belt-drive units and special units. The Spencer Turbine Co.

211 **Combination Scrubber-Vacuum** — A single unit that applies the cleanser, scrubs, and picks up—all in one operation—is described in this illustrated literature. Gives full specifications for company's Model 213P, for large area floors, and gives various methods of combination-machine-scrubbing suggested for hard, soft, oily floors. Also covers units for smaller and larger operations in gasoline-powered as well as electric models. Finnell System, Inc.

212 **Proper Care of Floors**—Filled with what-to-use and how-to-use-it information, this 32-pp booklet is a well written, practical text on floors. Presents floor preservation as a triple process involving cleaning, sealing and maintaining. Discusses various floor surfaces and their special problems. Gives helpful hints on floor maintainance and provides a handy chart covering preparation procedures and products for 12 common floor surfaces including cement, wood. West Disinfecting Co.

CONSTRUCTION

213 **Waterproofing Membrane Fabric**—The use of Fiberglas in company's waterproofing membrane is told in "Let's Look At Membranes" 16 pp. Comparisons of Glasfab and other types of membranes are drawn, and complete application methods described. Several case histories, covering industrial roofing jobs, highway bridges, pipe lines and chemical piping, show versatility of product and how it is applied. Twinsburg-Miller Corp.

214 **How to Use Presdwood—This 32-pp** booklet is filled with design and construction data on Presdwood. Although much of the material presented deals with use of Presdwood in homes, the book offers suggestions of value in industrial construction and remodeling. Sections of this practical handbook cover product data, working, application information for both interior and exterior use, and specifications. Includes instructions on proper conditioning, use of adhesives, types of bends finishing, interior joints, fastening. A table shows properties, sizes available and intended applications. Masonite Corp.

215 **Where to Use Your Stud Driver** — Twenty-pp pocket-size Form 955 describes and pictures applications of studs, using company's Model 450 stud driver. Provides some operating hints and safety precautions and covers use of studs through steel into concrete, wood into concrete, wood into steel and steel into steel, as well as their use for attachment of pre-drilled fixtures. Remington Arms Co., Inc.

216 **Lowdown on Suspended Ceilings**—Twelve-pp Bulletin A-129 is a "tell-all" brochure on a radiant panel heating, cooling, and acoustic control ceiling. Tells how company's three-way functional (suspended) ceiling is easy to lay out and install, competitive in cost. Diagrams and charts accompany text, which includes a brief of 12 advantages of this ceiling. Also provides departmentalization of components, performance characteristics, design and layout procedures, installation short cuts. Burgess-Manning Co.

217 **How to Glaze with Plexiglas**—Sixteen-pp Booklet PL-23 gives detailed information on glazing industrial and other buildings with flat panels of the acrylic plastic Plexiglas. Written for plant engineers concerned with frequent breakage of windows or other glazing problems. Gives properties and behavior of this sheet. Plastic Dept., Rohm & Haas Co.

218 **Translucent Structural Panels**—Bulletin 533, 12 pp, describes Resolite, a translucent structural material, corrugated or flat, molded of thermosetting polyester resins reinforced with woven glass fibers. Illustrates use of Resolite in partitioning, skylighting and decorating installations. Provides standard sheet specifications, general information on colors, weights, light transmission, thicknesses. Resolite Corp.

219 **Heat Absorbing Glass**—This 16-pp catalog describes Coolite, a glass designed to trap and absorb much of the sun's heat and to filter out annoying glare. Discusses types and thicknesses, gives light transmission data. Pictures many industrial installations and shows how conditioned natural illumination helps reduce operating costs. Mississippi Glass Co.

220 **Non-Slip Flooring**—Algrip, an abrasive rolled steel floor plate described as non-slip even on steel inclines, is the subject of Booklet A-5, 8 pp. Discusses safety features; gives fabricating data, sizes, allowable loads. Alan Wood Steel Co.

221 **Floor Scarifier**—Bulletin 83.4 describes and pictures a new hydraulically equipped machine designed for removal of traffic-packed grimes from trucking aisles in industrial plants. Explains how it cuts, picks up grime in one operation. G. H. Tennant Co.

222 **For Stairway Construction**—This 12-pp illustrated booklet describes the use of this company's Junior channels in stairway construction. Provides specifications and shows some of the buildings in which the channels have been used as stair stringers. Tables give size and weights, and shows allowable loads. Jones & Laughlin Steel Corp.

223 **Air Tools, Paving Breakers**—These two bulletins describe company's latest models of paving breakers and air tools for plant construction and maintenance work. Bulletin PB1 gives features and specifications on heavy-duty, medium-weight and lightweight paving breakers, as well as tools for use with them. Bulletin ST-100 describes and gives specifications for clay spaders, trench diggers and backfill tampers. Gardner-Denver Co.

TOOLS, WELDING AND MACHINE SHOP EQUIPMENT

224 **Hydraulic Pullers** — Industrial maintenance problems involving removal and installation of gears, bearings, pulleys sheaves, pinions shafts, couplings and tubes are treated in Power-Twin Bulletin HY-1953, 24 pp. Covers use and application of pullers, attachments and adaptors for 17½-, 30- and 50-ton hydraulic rams. Also shows puller sets for use with company's center-hole rams. Owatonna Tool Co.

225 **Machine Tools, Their Lubrication**—A history of machine tools, and explanation of their mechanical aspects and an analysis of the role of lubricants in their maintenance and operation are contained in this 80-pp booklet. Not a manual on tool lubrication, this book is a comprehensive discussion of fundamental factors in the construction, operation and maintenance of modern machine tools. Shows how power is controlled and force directed to shape metal by cutting and chipping; analyzes factors that contribute to friction and wear; and describes role of lubricants. Shell Oil Co.

226 **Ram Type Turret Lathes** — Catalog 101-A, 28 pp, explains and illustrates how this company's ram-type universal turret lathe is designed to provide more power transmission, more time saving, more width where it counts, more ease of operation, more accurate stops and other advantages. Large colored illustration shows construction features of the lathe. Bar and chucking equipment are pictured. General specifications for five models are included. Jones & Lamson Machine Co.

227 **Improved Cutting Oils**—Cutting oils for keeping parts and tools up to 50 deg cooler and representing a new concept in non-emulsifying oils are described in two new technical bulletins. Form A-2724 describes Sunicut 11-S and 209-S, non-staining dual-purpose oils primarily for medium duty to heavy duty operation on automatic screw machines. Form A-2723 covers Sunicut 102-S and 110-S, which contain active-type sulfur and are effective for heavy-duty operations. Sun Oil Co.

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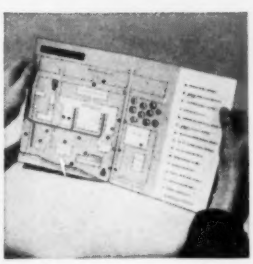

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DATA FILE

(Begins on page 218)

228 **Data for the Shop**—"Fluids and Facts for Metal Working," is a pocket-size booklet of about 44 pp. A section on metal working fluids covers their function and selection, preparation and use of soluble oils and paste compounds, and prevention of dermatitis. A section on metal working facts gives conversion tables, steel numbering systems, machinability ratings of metals, drill grinding charts, twist drill sizes and other data. Booklet also includes product data on industrial oils, machine tool lubricants, greases, quenching and tempering oils. Standard Oil Co. (Ind.).

229 **Resistance Welding**—Featured in this 24-pp catalog are newly-designed tips and holders recently added to company's equipment. Full information is also given about other holders, tips, seam welder wheels and shafts and bushings, in manufacturer's line, as well as flash, butt, barrel and other welding dies. Ampco Metal, Inc.

230 **For Hard-to-Weld Metals**—Catalog ADC 709B, 16 pp, explains features of company's Heliwelding (tungsten arc welding) process and the equipment used with it. Describes, shows in operation, manual holders, machine holders for use with semi-automatic equipment, others. Shows automatic hard-facing process using vibratory feeder, accessory equipment including control panel. Air Reduction Sales Co.

231 **Flux Recovery Equipment**—How company's flux recovery equipment salvages valuable flux, saves man-hours, and speeds and improves welding is told in this 6-pp illustrated bulletin. Describes primary separator and feed tank. Pictures some typical recovery installations. Invincible Vacuum Cleaner and Mfg. Co.

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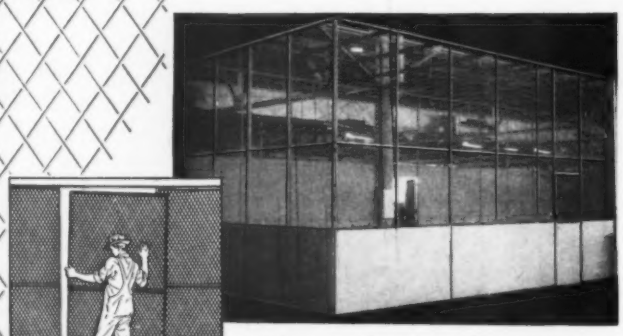

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WATER TREATING

232 **Information on Ion Exchangers**—Here are three booklets on ion exchangers: Nalcite HCR, a styrene type cation exchanger; Nalcite SAR, a basic anion type; and Super Nalcolite, a synthetic gel type zeolite for cation exchange. Tables and graphs explain performance of these water treating resins under various operating conditions. Physical characteristics, exchange capacities, regeneration techniques discussed. Bulletin 57, 20 pp, is on Nalcite SAR; Bulletin 58, 28 pp, Nalcite HCR; Bulletin 59, Super Nalcolite. National Aluminate Corp.

233 **Condensate Line Corrosion**—Attributing condensate line corrosion chiefly to carbon dioxide in the steam and water, Technical Paper 127 discusses various methods of minimizing boiler feedwater alkalinity, especially the use of filming amines. Reports field results under various conditions. W. H. & L. D. Betz.

BOILERS, GENERATORS

234 **Oil or Gas Fired Automatic Boilers**—Boiler, burner, controls and safety features of 10 to 500 hp oil or gas fired automatic boilers are described in this 4-pp bulletin. Firing rates, dimensions and capacities are given for all models. Boiler Engineering & Supply Co., Inc.

235 **Packaged Boilers**—This 16-pp illustrated catalog describes manufacturer's new Type TP package boiler. Following a section of background information is an outline of principal design features of these boilers, which are shop assembled and provide steam capacities from 4000 to 30,000 lb per hour. Space requirements are shown in a table along with specifications. Combustion Engineering, Inc.

399 **Automatic Boilers for Oil, Gas**—Bulletin 1230, 8 pp, discusses manufacturer's new line of simplified Powermaster packaged automatic boilers, including oil, gas burning, and combination units, in nine sizes from 15 hp through 100 hp, thus covering steam requirements to about 3450 lb/hr, also hot water designs. Gives details of design and construction, sample specifications. Orr & Sembower, Inc.

236 **Shop-Assembled Boiler**—Sixteen-pp, Bulletin G-76, completely describes and illustrates company's Type FM water-tube integral-furnace boiler, made in standard sizes from 2900 to 28,000 lb of steam per hr, pressure to 250 psi. Capacities, dimensions given. The Babcock & Wilcox Co.

237 **Steam Generators**—"Cyclonic combustion," a new method of heat transfer is discussed in this bulletin. Descriptive drawings show how air is introduced into combustion chamber at high speeds in revolving spiral vortex, radiating heat to fire tube through direct radiation and convection. Cyclotherm.

238 **Water Tube-Steam Generation**—Bulletin SB-51, 16 pp, discusses features of Keystone two-drum water tube steam generator for delivery of low cost steam. Cites advantages of conservative boiler rating (full five sq ft of heating surface for each developed horsepower), automatic controls, easy installation, fast steaming qualities, compact size. Gives specifications on all materials furnished, includes accessories. Erie City Iron Works.

239 **How Much for Steam**—This is a "slide rule" calculator for computing steam costs. It's pocket-sized, and enables a plant engineer to find comparative steam costs per 1000 lb, using coal, oil or gas, and based on fuel costs of price per ton, gallon, cubic foot. Cleaver-Brooks Co.

240 **Package Boilers**—This illustrated bulletin describes and lists manufacturer's line of water tube package boilers in 12 sizes from 6,000 to 39,000 lb of steam per hour and for

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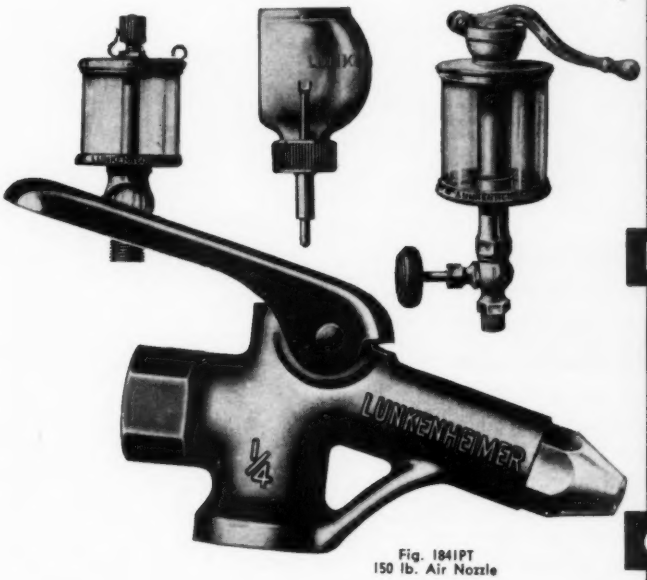
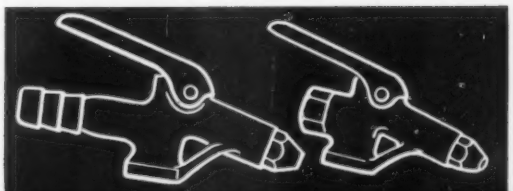
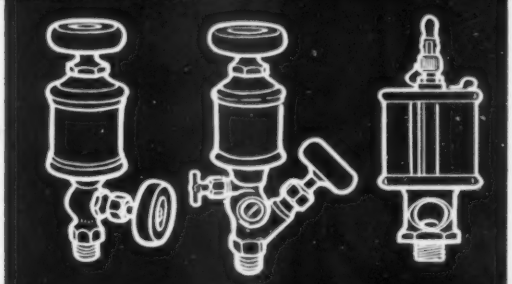


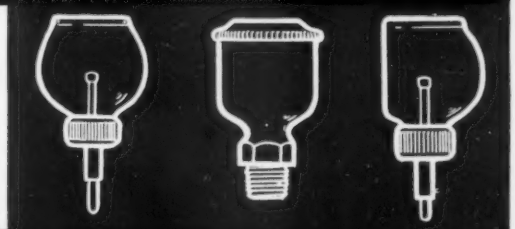
Fig. 1841PT
150 lb. Air Nozzle



AIR DEVICES



LUBRICATORS



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DATA FILE

(Begins on page 218)

pressures to as high as 900 psig. Contains full information on dimensions and weights. Stresses high operating efficiency with oil, gas or combination firing. Springfield Boiler Co.

241 **Improved Steam Generator**—Bulletin 2000, 28 pp, explains advance design features that distinguish this manufacturer's generator from other unit steam generators. Describes and illustrates engineering differences of component features. Also shows how these components are constructed, assembled and tested. Another section gives data and dimensions and standard and accessory equipment for the units from 20 to 6000 hp for pressures to 250 psi. Preferred Utilities Mfg. Corp.

242 **Steam Generators**—Data and specifications for completely plant assembled water-tube steam generators are contained in this 8-pp bulletin. They cover nine sizes from 5,300 to 33,000 lb steam per hour and for pressures up to 400 psi. These units are designed for fully automatic firing with oil, gas or stoker-fired coal. Superior Combustion Industries, Inc.

FANS, BLOWERS

243 **Fan Engineering Data**—Bulletin A-108, 16 pp, gives fan laws and formulas, terminology and recommended velocities for exhaust hoods. Includes air pressure conversion table, charts on dust resistance, entrance losses and rectangular equivalent of round ducts. Discusses fan installation, maintenance and lubrication, also noise problems. Hartzell Propeller Fan Co.

244 **Industrial Fans**—Propellair Bulletin 650, 12 pp, contains dimensions, application, and performance data of Tubeaxial and Stack-booster fans. Gives information on cooling and drying problems, system and open surface tank ventilation. Robbins & Myers, Inc.

245 **Heavy Duty Fans**—Eight-pp Catalog 1380 describes three classes of company's Series 2000 heavy duty fans for induced draft service. Gives maximum wheel speeds, total pressures, volume ranges. Presents graph of certified hp, efficiency and pressure rating of new blade design, factors contributing to ratings. Discusses optional inlet damper control. Sturtevant Div., Westinghouse Electric Corp.

246 **Industrial Exhaust Fan**—Housing design, wheel construction and standard arrangements of manufacturer's Type EX exhausters are discussed in illustrated Bulletin C-46EX. Provides capacity tables, dimensions and photos of standard and special fan. Bayley Blower Co.

247 **Induced Draft Fans**—Eight-pp Bulletin DB-32-53 provides engineering information on manufacturer's Bifurcator fans for providing controlled draft for boilers and furnaces. Gives construction details, sizes. Illustrated with photos, diagrams of suggested methods for installation. DeBothezat Fans Div., American Machine and Metals, Inc.

INSTRUMENTS, CONTROLS

248 **Recording, Controlling Instruments**—Circular M-2-A, 48 pp, illustrates, discusses manufacturer's entire line of mechanical industrial instruments, including fixed stem and distant reading dial thermometers, temperature and pressure recorders, controllers, diaphragm motor valves. A listing of 9-, 10- and 12-in. circular recorder charts is also available. Weston Electrical Instrument Corp.

249 **Flow Meters**—Catalog 2320, 58 pp, fully illustrated, describes all types of manufacturer's flow meters, including indicating, recording, integrating and controlling instruments of evenly graduated and square root types, as well as area meters and differential converters. Includes tables on flow approximations, installation information, factors necessary to determine if fluid to be measured can be properly handled. Industrial Div., Minneapolis-Honeywell Regulator Co.

250 **For Liquids Worth Storing**—Bulletin 6405 offers an illustrated discussion of company's self-contained gages for liquid level applications, covering both direct- and remote-reading types, also a dial type hydrostatic gage. Stresses value of measuring stored liquids. Liquidometer Corp.

251 **Gage Glasses**—Pyrex and Corning gage glasses, their dimensions and tolerances, recommended maximum working pressures, are discussed in Bulletin EG-1. Explains how to cut odd lengths of tubular gage glasses and how to install them. Technical Products Div., Corning Glass Works.

252 **Portable Scales**—Form 2004 describes company's new 200 series of scales, presenting both bench and full-height models. Stresses larger platform, new locking mechanism, other advantages of these scales for use on receiving dock, in manufacturing processes, shipping rooms. Toledo Scale Co.

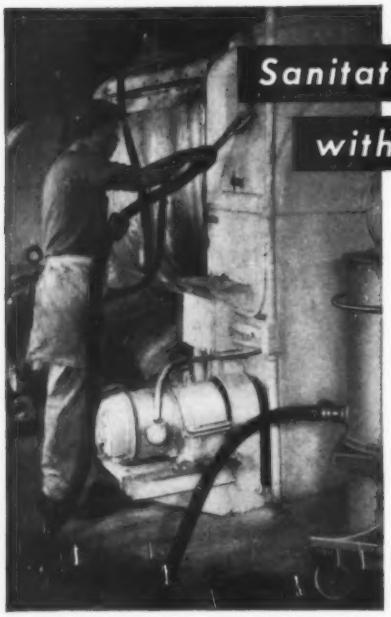
253 **Electronic Controls**—Eight-pp Catalog F 6166 describes flexibility of an electronic control system for heating, ventilating and air conditioning. Describes temperature controls, control panel, sensing elements, as well as the ultra-sensitive micro relay which simplifies the amplifier. Barber-Colman Co.

254 **Handbook on Automatic Controls**—Catalog 700 provides 45 pp of ordering and application data on automatic controls with mercury contact switches. Covers control equipment for temperature pressure-low water, liquid level bottles; transformer-relays, valves. The Mercoid Corp.

255 **Refrigeration Controls**—Bulletin 109 describes the application of mercury-bulb instrumentation down to —30 F. Instruments presented cover conditions normal to food and drug processing, petro-chemistry, air conditioning, baking, etc., and include indicating, non-indicating, recording types. The Partlow Corp.

MECHANICAL POWER TRANSMISSION

256 **Transmission, Control Equipment**—Variable speed transmission and speed control devices are presented in 48-pp Catalog 45. Fully illustrated, provides descriptive and application information, operating principles, dimensional tables. More than 60 photos show use of this power transmission equipment in paper mills, food processing plants, textile plants, others. Lewellen Mfg. Co.



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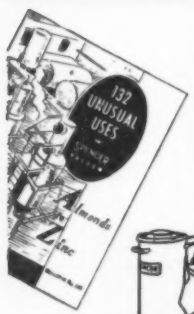
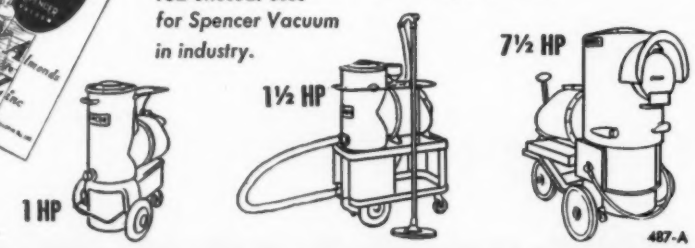


Send for Bulletin No. 144 describing 132 unusual uses for Spencer Vacuum in industry.



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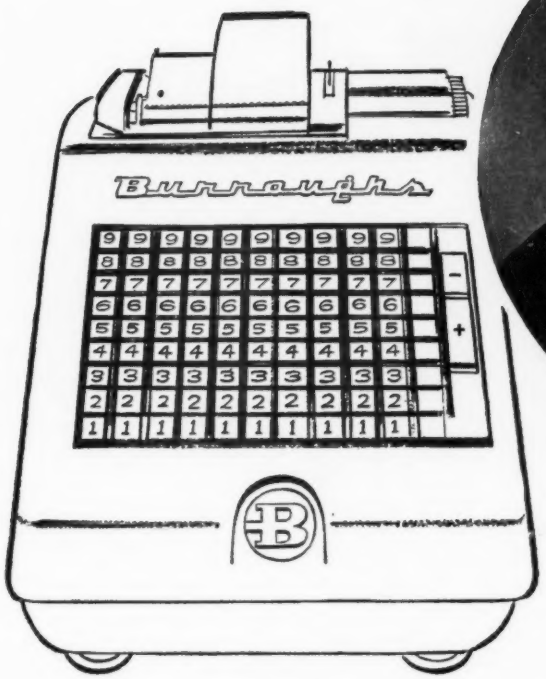

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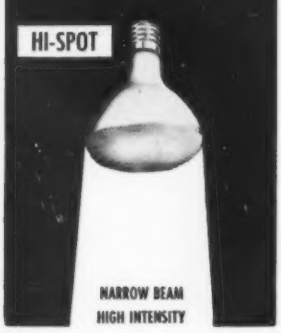

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You'll find two postage-free Reader Service Cards on pages 215-216. Use them for ordering these bulletins — just circle the item numbers of those you want. You may also use the cards for requesting advertised catalogs.

DATA FILE

(Begins on page 218)

257 **Coupling or Converter**—To promote a better understanding of hydraulic couplings and torque converters, this 32-pp publication tells where couplings or torque converters should be used, and why, furnishing a source of facts on non-technical terminology. Covers meaning and characteristics of torque and effect on driving and driven equipment. Twin Disc Clutch Co.

258 **Power Transmission Equipment**—Form 118, 24 pp, gives descriptive and technical information on variable speed pulleys, wide V-belts, sheaves, motor bases, countershafts, and Select-O-Speed transmissions. Illustrated with photos and dimensional drawings, booklet provides ratings, sizes, application and installation tips. Lovejoy Flexible Coupling Co.

259 **Steel Couplings**—Bulletin 4100, 32 pp, provides engineering data covering the selection and application of company's standard Steelflex couplings. Large cutaway illustration shows construction features of these couplings which are designed to accommodate parallel and angular mis-alignment and free end float. Photos show industrial installations of these couplings. Book also lists brakewheel, controlled torque, high speed and other couplings for special applications. The Falk Corp.

260 **Adjustable V-Belt**—This 8-pp catalog covers company's new Veelos TD and TE v-belt designed to reduce installation and operation costs on big drives. Studs, cup-washers and T-screws of the belt are illustrated, and installation and operation characteristics explained. Booklet includes directions on how to measure, to couple and uncouple, and to install. A table shows correct lengths for these belts. Manheim Mfg. & Belting Co.

261 **Belts to Suit the Job**—This bulletin presents company's "inner-locked" woven duck belting available in types for general elevating and conveying and general power transmission as well as special jobs. Imperial Belting Co.

262 **Sprockets, Roller Chain**—Bulletin A-624 24 pp, is compiled to provide plant engineers with all data required for selecting and ordering roller chain and sprockets. A page devoted to Taper-Lock sprockets for each size of chain from 40 to 100, giving sectional drawing, dimensions, number of teeth, maximum stock bore available, weights, prices and other data. Another page covers Taper Lock bushings; and full information is given on riveted and cotter-type roller chains. Dodge Mfg. Co.

263 **Improved V-Belts**—This literature on company's Vulco rope drives explains how this rope with concave sides is designed to fill out to a precise fit in the sheave groove, to provide less wear, more pulley contact and more sure power when needed. The Gates Rubber Co.

264 **Power Drive Handbook**—Catalog 709, describing roller chains and sprockets, includes tips on selecting stock roller chains for every type of power drive service. Diamond Chain Co., Inc.

265 **Flexible Couplings** — Condensed Engineering Catalog 51-A contains excellent data on the choice and use of company's flexible metal couplings. Tells advantages of these couplings and discusses design principles. Double-flexing and floating shaft types, light duty couplings and types for special applications are described and pictured in detail. Thomas Flexible Coupling Co.

DUST CONTROL

266 **Manual of Exhaust Hood Design**—Bulletin 270-E1, 24 pp, features engineering data on dust control systems for the metal working industries. Illustrates and discusses the design of exhaust hoods for many operations in this field. Also, 61 photos of dust control installations show various methods of hooding dust sources. American Air Filter Co., Inc.

267 **Dust Control** — **Engineered Efficiency in Dust Collection and Recovery,"** 36 pp, discusses industrial dust recovery from standpoint of nuisance abatement, waste avoidance, hazard

Heat Recovery is Dollar Recovery. Whether you use it to generate steam . . . or dissipate it up the stack — every BTU you generate costs you money. That's why, even on boilers with capacities as low as 25,000 pounds of steam per hour, it is most often economically right to do something about the waste heat. With the new *Packaged Ljungstrom Air Preheater,* you can apply to your small boilers the principles of heat recovery used by large utilities, where fuel efficiency is sought in every way possible. The Packaged Ljungstrom Air Preheater is a *continuous regenerative counterflow* unit. That is it transfers heat continuously from exit gas to incoming air streams by exposing heating surfaces on a slowly revolving rotor, alternately to both streams. It is highly efficient . . . low in cost . . . and fully reliable.

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DATA FILE

(Begins on page 218)

elimination. Shows effect of variation in particle size, distribution and specific gravity of dust on efficiency of the dust collecting system. Buell Engineering Co., Inc.

268 **Dust and Fume Eliminators**—Catalog 482, 12 pp, describes company's Centri-Merge dust and fume eliminators explaining advantages of the swirl action incorporated. Illustrations and dimensional drawings of units with capacities ranging from 400 cfm up to 5000 to 30,000 cfm. Schmieg Industries, Inc.

269 **Dust Control, Blast Cleaning**—Bulletin Cleaning 1210, 24 pp, fully illustrated, describes manufacturer's line of blast cleaning and dust control equipment, accessories. It is indexed according to equipment, type and purpose. Lists three methods of abrasive application, describes equipment using them. Pangborn Corp.

270 **Improved Dust Filters**—Sixteen-pp Bulletin 528-R gives information on continuous-automatic dust filters that can be furnished or unhoused for use on pressure or vacuum. Explains principle of cleaning the filter cloth with high pressure reverse jet air, and tells where these filters are being used. Provides comparative test data on these and other type filters; discusses industrial dust control service offered and diagrams some installations. Self-adjusting blow rings furnished with these filters are described in detail. The Day Co.

271 **Dust and Fume Collector** — Revised Bulletin 164-3 describes automatic bag type dust arresters, with illustrations of principal components and schematic diagram of typical installation. Capacities under 2 to 1 and 3 to 1 cfm ratios are quoted in table of arrester sizes and dimensions. Collecting efficiency and other advantages offered by cyclic cleaning are discussed. The Northern Blower Co.

ELECTRICAL EQUIPMENT

272 **Motor-Generator Reference Book**—Publication 51R7933 is a 50-pp booklet compiled to assist in the selection of motive power to handle most industrial applications. Neither text book nor ordering catalog, this book provides a brief outline of the various types of motors, generators and motor-generator sets, telling their application and operating requirements. Booklet is generously illustrated and includes performance data, ratings, information on methods of speed control. Allis Chalmers Mfg. Co.

273 **Variable Speed Motors**—Sixteen-pp Bulletin 1797, revised, outlines many reasons why variable speed motors can be used to improve production, and it includes illustrations of all types of company's Varidrive motors, as well as their mechanical features, remote controls, etc. U. S. Electrical Motors, Inc.

274 **Motor Controls**—In this 28-pp bulletin the most important items in company's line of standard motor control apparatus for all industries are presented. Controls, starters and accessories are described and applications listed. Allen Bradley Co.

275 **FHP Manual Starters**—Bulletin 224 is a folder giving the features and ratings of a line of fractional horsepower manual starters. Lists applications for them and pictures enclosures. Square D Co.

276 **Motor Starters**—Booklet 1062, 16 pp, describes motor starters having short circuit protection for 2200- to 5000-v systems. Illustrates starters using company's 50,000 kva interrupting capacity type ZHS contactor; also starters which will safely interrupt the circuit from a bus of unlimited capacity. Indoor and outdoor installations are pictured. The Electric Controller & Mfg. Co.

277 **Cartridge Fuses**—Form S-60, 12 pp, describes and illustrates manufacturer's dual-element cartridge fuses designed for long and controlled blowing time. Lists benefits afforded by these fuses and gives data on both ferrule type and knife-blade type. Provides selector table covering sizes of fuses for protection of single-, two-, and three-phase motors

DATA FILE

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of 1/6 to 200 hp. Also includes time current curves. Economy Fuse & Mfg. Co.

278 **Productive Maintenance** — Publication GED-1691 is a pocket-size 104-pp source of information of value to plant engineers who want to get more production from their present motors, generators and control equipment. Besides general maintenance suggestions, the booklet contains trouble shooting charts and recommended renewal parts guides. Also provides wire and cable data and includes a section of formulas and other data pertaining to motors and generators. General Electric Co.

279 **Toggle Switch**—Catalog 73a, 12 pp, covers 19 precision snap-action toggle assemblies and more than 90 AN and JAN approved designs, including assemblies that will control from 1 to 24 separate electrical circuits. Contains dimensions, operating characteristics, electrical ratings, contact arrangements on each switch, and an illustration of one representative switch from each group of switches. Gives general information on each "family" of switches, which are designed for low voltage d-c applications. Micro Switch Div., Minneapolis-Honeywell Regulator Co.

280 **The Answers on Wiring**—"20 Questions and 20 Answers on Safety m.i. Wiring" describes and illustrates characteristics and advantages of this new wiring system. A complete table of types, sizes, weights, and lengths, as well as a partial list of users included. General Cable Corp.

281 **Power and Control Cables** — Sixty-pp Catalog 24 describes typical power and control cable designs and is intended as a guide in selecting proper wire and cable type. Describes insulations, sheaths and coverings, electrostatic shielding, and includes product data on all types listed. Rome Cable Corp.

282 **Retractile Cords** — This 8-pp bulletin presents retractile cords for general communication and power applications. Containing catalog data and ordering information as well as application photos, explains how the cords are made, where used, and advantages offered. Koiled Kords, Inc.

283 **Flexible Cords** — This well-illustrated 24-pp booklet includes all new Underwriters' classifications for flexible cords manufactured by this company. Featuring data on Dynaprene and rubber jacketed cords as well as braid covered types, also gives tips on how to select proper cord. Whitney Blake Co.

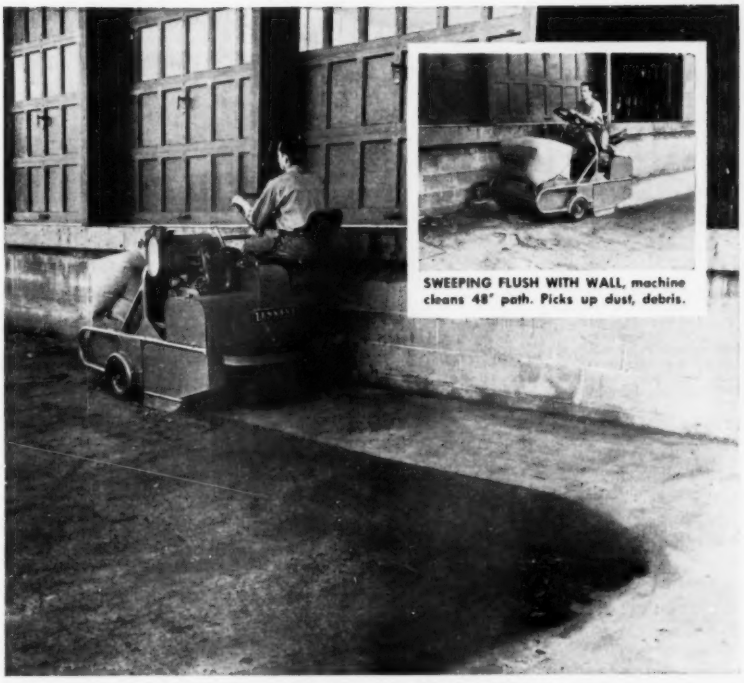
284 **Handbook on Storage Batteries**—This 64-pp booklet of instructions and technical data is the sixth edition of this company's battery service manual. Provides a brief treatise on the theory of the lead-acid battery. Gives detailed instruction on the care and operation of batteries, on maintenance and repairs, and on standard and special parts. Booklet is of special value to plant engineers concerned with storage batteries for cycle service in industrial trucks and materials handling equipment. Gould-National Batteries, Inc.

285 **Battery Maintenance Tips**—Form 5063 is an 8-pp pocket-size booklet on storage battery maintenance which breaks down battery care to seven basic rules, each emphasized by cartoon treatment and brief text. Booklet is suited for distribution to maintenance personnel as well as to those indirectly associated with batteries, such as purchasing department personnel. Includes suggested maintenance chart forms. Exide Industrial Div., The Electric Storage Battery Co.

286 **Industrial Truck Batteries** — Bulletin IT-520 covers company's complete line of industrial truck batteries and gives details such as dimensions, wet and dry weights, types of containers, and capacities at the 6- and 8-hr rate. C&D Batteries, Inc.

LIGHTING

287 **Selection Data on Lighting Fixture Hangers**—Catalog 50, 80 pp, contains general and detailed information on disconnecting and



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In a few fast seconds, one man sweeps the path shown here—at a rate a skilled pushbroom crew of 3 to 12 men couldn't begin to equal.

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Use anywhere heavy loads are moved and rubber tired wheels are desired. 54" long, 28" wide, 42" high at handle. Top of platform 14" off floor. Welded construction. Heavy ¾" plate. Two swivel wheels at handle end. Approx. wt. 300 lbs.

WHEN ORDERING always give "item" number. All PRICES are f.o.b. Detroit. Prices are subject to change without notice. Write for catalog.

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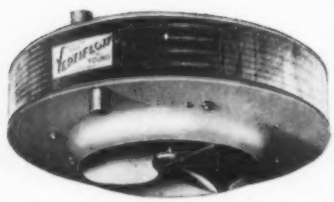
HOW EFFECTIVE HEAT DISTRIBUTION LOWERS PLANT HEATING COSTS...

with YOUNG "Vertiflow" Unit Heaters

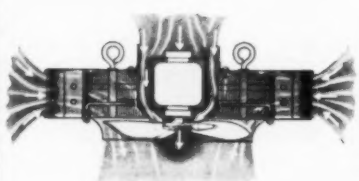


YOUNG "VERTIFLOW" UNIT HEATERS offer low final temperature for maximum heating efficiency. They can be placed at greater heights to heat larger areas quickly and evenly . . . reducing air stratification to a minimum.

"Vertiflow" Unit Heaters are available in models from 52,000 to 552,000 btu for steam or hot water service. Various types of diffusers are available to meet specific distribution requirements.

EXCLUSIVE YOUNG DESIGN with room air drawn through ventilating stack and over motor, keeps motor cool . . . prevents motor "bake-outs," minimizes service. When motor is off, cooler room air reverses flow, keeps motor cool.

For further details contact your nearest YOUNG Representative listed in the yellow pages of your phone book, or write YOUNG Radiator Company, Dept. 324-J, Racine, Wis.



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DATA FILE

(Begins on page 218)

lowering lighting fixture hangers, accessories, special devices and parts. Utilizes 247 photos and drawings to show construction principles, operating features, installations, modifications and component parts for both indoor and outdoor units. The Thompson Electric Co.

288 **Precision Lamps** — Bulletin 40 offers application and purchasing information on various types of lamps carried by manufacturer. Flood, infra-red, spatterproof, and weatherproof lamps are briefly discussed. Radiant Lamp Corp.

289 **Lighting Fixtures**—New Section K of Condulet Catalog 3000 describes components, performance data, and methods of relamping for any of the manufacturer's new EV series explosion-proof and weather resistant lighting fixtures. It contains illustrations showing steps for easiest relamping and installation of this type of fixture. Crouse-Hinds Co.

290 **Lighting Fixtures**—Full information on company's fluorescent lighting fixtures designed for efficient industrial lighting and reduced maintenance is provided in Form OD-568. Day-Brite Lighting, Inc.

VENTILATING AND AIR CONDITIONING

291 **Air Conditioning Filters**—Bulletin 600, 8 pp, describes company's Staynew ventilation and air conditioning filters. Specifications, engineering, performance and installation data covering dry type panel filters, for the removal of air-borne impurities given. Dollinger Corp.

292 **Industrial Ventilation Guide**—Bulletin 1520, 28 pp, presents ventilating problems peculiar to industry and shows some of the ways in which company's equipment is solving those problems. They cover general ventilation, heat and steam exhaust, smoke and fume exhaust, air circulation, equipment cooling, dust removal, air filtering, heating. Includes data on air change requirements, information on fan selection, and location use of ducts with propeller fans, other helpful data. Ilg Electric Ventilating Co.

293 **How Conditioning Units Can Help**—The advantages of self-contained units in cooling, dehumidifying, cleaning are cited in 40-pp Catalog 1307. Explains installation, operation. Provides data on direct expansion and cold water cooling and on hot water and steam heating. Clarage Fan Co.

VALVES, TRAPS, PIPING AND ACCESSORIES

294 **Bronze Valves**—Globe and angle bronze valves with rising stems, union bonnets and stainless steel plug type seats and discs are described in this bulletin. Discusses design advantages, gives dimensions and specifications. Walworth Co.

295 **Valves and Fittings**—Illustrated Catalog 47 provides over 60-pp of ordering information and application data on valves and fittings made of stainless steel and other corrosion resistant alloys designed for use where corrosion or contamination are factors. Gate, globe, and angle valves for a wide range of services are presented, also needle valves, sampling valves, screwed and flanged fittings. Design and construction details are shown. Also included is a chart of first and second recommendations of alloys for corrosive media. Alloy Steel Products Co., Inc.

296 **Bronze Gate Valves**—Illustrated Circulars 534 and 574 describe a line of 150- and 200-lb service pressure bronze gate valves. Complete with dimensions, these circulars give advantages of flange and screw gate valves in rising and non-rising stem types. The Lunkenheimer Co.

297 **Relief Valves** — Twenty-pp Publication 5200 is replete with data on company's multi-port relief valves for steam, air and gas service. Charts, diagrams, tables and examples of

DATA FILE

(Begins on page 218)

plant operating conditions serve to show how to select a relief valve. Text and illustrations show advantage of these valves over other relief valves, and booklet also shows how the Multiport relief valve can be used as a differential pressure spillover valve or as a check valve in closed systems. Cochrane Corp.

299 **Choosing the Right Valve**—Presenting valve selection as a matter of matching the valve's service characteristics with the service requirements of the job, this practical 20-pp booklet explains and illustrates basic design features of gate, globe and check valves. It tells, in non-technical language, how each of these valve types works, and where it is best suited for use. Disc, stem connection, bonnet and bonnet-joint characteristics are also discussed and the importance of stem operation is treated. A final chapter is devoted to common materials of valve construction. Crane Co.

300 **Steam Trap Book**—Catalog J, 44 pp, includes physical data and prices on cast semi-steel and forged steel inverted bucket steam traps, compound steam traps and ball float air and air relief traps; a handbook section explaining how to calculate condensate loads and select traps for all classes of equipment; a maintenance section. Armstrong Machine Works.

301 **Steam Trap Reference Manual** — Bulletin T-1740, 24 pp, tells why and where steam traps should be used; explains desirable trap features. Advantages of company's impulse steam traps are described, their operation illustrated. How to figure trap sizes and how to size condensate return lines are told and capacity and pipe dimension charts and thermodynamic properties of saturated steam included. Yarnall-Waring Co.

302 **Steam, Air and Gasoline Traps** — Catalog 751, 32 pp, is a recently issued trap ordering book with capacity tables, installation diagrams, and containing charts and formulas for determining proper size trap for specific applications. Covers thermostatic steam traps, expansion steam traps, weight-operated traps for steam, air, gasoline, pressures up to 1500 lb; separators. W. H. Nicholson & Co.

304 **Jacketed Piping, Cocks**—Twelve-pp Bulletin 152 discusses the special advantages, problems and requirements of jacketed piping installations and shows how manufacturer's jacketed piping, cocks, fittings and relief valves are designed to fulfill requirements. Illustrated with photos and drawings, includes specifications. Parks-Cramer Co.

305 **Steel Unions**—This catalog sheet describes and pictures several types of steel unions, telling applications of each and listing sizes, prices. Clayton Mark & Co.

307 **Packless Expansion Joints**—Bulletin 35-51A offers 28 pp of up-to-date information on company's Corruflex joints, their design and installation and advantages over other means of providing for thermal expansion in pipelines. Construction features are explained and illustrated; simplified selection data include tables for determining amount of expansion in pipelines. American District Steam Co., Inc.

309 **Welded Fittings**—Catalog 3 is a 36-pp ordering and engineering reference book on company's Weldolets for piping services. Gives data on butt-welding and socket welding Weldolets as well as on Thredolets for making threaded outlets. Typical installations are pictured; sizes, weights and prices provided. Also included are installation instructions and a technical section. Bonney Forge & Tool Works.

310 **Handbook on Fitting Flanges**—Catalog wf-1950, 68 pp, offers working information on seamless carbon steel welding fittings and forged steel flanges. Includes dimensional tolerances, thread standards and threading practice; service pressure, ratings, physical and chemical requirements. Grinnell Co., Inc.

311 **For Stopping Pipe Leaks** — Illustrated Catalog 54, 32 pp, describes, gives specifications of manufacturer's line of steel, cast iron pipe repair clamps, service saddles, valve and bibb reseaters. Tells how to repair all types of leaks in water, steam, gas, oil lines, also gives installation tips. M. B. Skinner Co.

312 **Pipe Insulation**—Bulletin F 1-100 features on-the-job installation photographs of cellular glass insulation for pipe temperatures between —300 and 800 F. Complete listing of physical properties, condensed specifications are given. Pittsburgh Corning Corp.

HEATING, COOLING

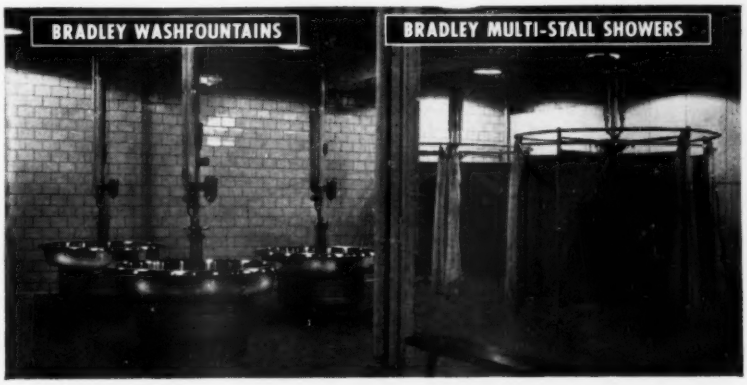
313 **Forced Air Space Heaters**—Illustrated Bulletin 523-B, 12 pp, is devoted to a line of forced air heaters for comfort heating, year-round ventilating, tempering make-up air, process drying and heat curing. Explains design efficiency, construction details, operating principles and flexibility of application. Advantages of the heater are detailed. Dravo Corp.

314 **Buying a Portable Heater?**—Stressing safety factors involved, this 40-pp booklet, "Guide to the Selection and Use of Portable Space Heaters," analyzes temporary heating equipment from standpoints of personnel well-being, property protection and fire and accident prevention. Classifies basic types of direct, indirect-fired heating devices. Herman Nelson Div., American Air Filter Co., Inc.

315 **Electric Heaters**—Bulletin E-1, 8 pp, describes electric unit heaters and heater sections for general industrial heating as well as for specialized use in heating corners of factories, warehouses. Illustrates overhead downward discharge heaters with revolving and stationary discharge outlets, and a heater with horizontal discharge. L. J. Wing Mfg. Co.

316 **Engineering Data for Heating Systems**—A great deal of helpful information on heating systems is presented in Engineering Data Manual 2695, 28 pp. Detailed illustrated information pertaining to heating problems is given. Besides covering heating terminology, there are sections on steam data, water properties, piping data, weights and measures and pipe dimensions. C. A. Dunham Co.

MORE STEEL PLANTS ARE MODERNIZING WITH SANITARY WASHING FACILITIES



Portion of one of Inland Steel's washrooms with Bradley Washfountains and Multi-Stall Showers.

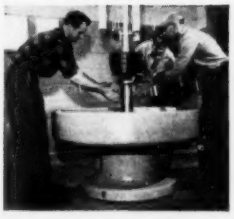
LOWER INSTALLATION COST, FEWER PIPING CONNECTIONS —LONG-LIFE FIXTURES

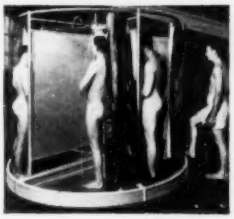
Each Bradley Washfountain accommodates up to 10 men simultaneously, yet only one hot water, one cold and one drain connection are required.

Three piping connections are required to serve five stalls of the Bradley Multi-Stall Shower.

Connections can be made from above as shown or from underneath.

For the complete details, write for well-illustrated Catalog 5204.





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BRADLEY washfountains AND multi-stall showers

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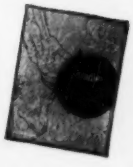

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How a 'Sexauer' Easy-Tite faucet washer costing pennies can save you $115.22 a year!

A tiny, 1/32" faucet leak wastes 95,040 gallons—*$24.14* worth*—of water yearly.

Hot water leakage is even costlier . . . Fuel waste adds upward to *$91.08*** more to the loss. Total down the drain: *$115.22.*

And this is the dollar loss caused by only *one* pinpoint leak!

Fuel Waste	Water Waste	Total Waste
Oil (792 gals.) **$91.08	$24.14	$115.22
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Gas (84,411 cu. ft.) 84.81	24,14	108.95

*Water costs (figured at $1.90 for 1,000 cu. ft.) authenticated by Hackensack Water Co. **Fuel costs authenticated by American Gas Association.

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Built like a tire with Fiberglas reinforcement

Easy-Tite faucet washers are made of a special du Pont product, instead of rubber, and reinforced with Fiberglas. The result is a washer that resists the closing squeeze that splits and mushes ordinary washers. And Easy-Tites withstand destructive heat (up to 300° F. by test). These features explain why *'Sexauer' Easy-Tites outwear ordinary faucet washers 6 to 1!*

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DATA FILE

(Begins on page 218)

317 **Plumbing, Heating Supplies**—Edition G is the current edition of this company's 118-pp general catalog on plumbing and heating repair parts, tools and accessories. Indexed and generously illustrated; gives sizes, intended uses and ordering data. J. A. Sexauer Mfg. Co., Inc.

318 **What Unit Heaters Can Do**—Featuring many photos showing how unit heaters are being used to provide heating comfort, cut fuel costs, provide economical air circulation, 8-pp Bulletin 149-A discusses advantages of these heaters and gives performance data. Modine Mfg. Co.

320 **Utility Heaters**—Fully illustrated, Catalog 6253 presents heaters for use in mobile units and small space heating requirements. Includes capacity and design information. Young Radiator Co.

322 **Industrial Dry Coolers**—Illustrated Bulletin DC-50, 12 pp, presents dry cooling equipment for small, "in-between," and heavy-duty cooling jobs and includes three recent models. Two are small "portable" units and the third a medium size unit. Although designed primarily for cooling engine jacket water, they can be used for cooling natural gas, lube oils, fluids of refining stages. The Marley Co., Inc.

MATERIALS HANDLING

323 **Overhead Handling Equipment**—Booklet 2008-K, 12 pp, is a newly revised edition of this company's engineering and application data booklet covering overhead materials handling equipment. Describes and illustrates track drives, cranes, electrification, buckets, grabs. Cleveland Tramrail Div., The Cleveland Crane & Engineering Co.

324 **Engineered Monorail Applications**—A file of application literature is announced as the beginning of a new service offered potential users of monorail equipment. Includes a technical booklet on automatic dispatch systems and an equipment bulletin in addition to several case studies of installations. As they are completed new groups of case studies will be sent to holders of file. Available to qualified plant engineers. The American MonoRail Co.

325 **Locomotive Cranes**—Catalog 84, 16 pp, stresses advantage of the torque control unit used in company's cranes and features illustrations of the mechanism and converter unit. Describes in detail the sealed, anti-friction bearings, air controls, brake, limit switch and other components. Orton Crane & Shovel Co.

327 **Industrial Shop Cranes** — Twelve-pp Bulletin 6-B describes Cranemaster overhead travelling cranes in capacities to 15 tons, spans to 60 ft. Crane bridge, trolley and other components are described in detail and optional equipment listed. Dimensions and specifications for four basic types to suit various building conditions are provided. Abell-Howe Co.

To order these catalogs circle item numbers on the handy Reader Service Cards provided on pages 215-216.

328 **Cranes for Big Jobs**—A new 1½-yard shovel, 35-ton crane is described in this 6-pp catalog. Action pictures of the machine in quarries and gravel plants are included, along with general specifications. American Hoist & Derrick Co.

329 **Tubular Conveyors** — Form HC-541 contains about 44-pp of data on tubular conveyors for moving almost any flowable material. Shows basic types of these conveyors, tells what they're designed to do and how they are applied. Lists materials being handled to ad-

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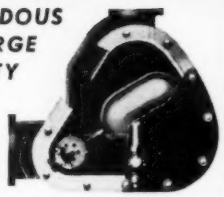

Continuously discharge condensate under vacuum or positive pressures suitable for inlet pressures up to 200 psi. Highest discharge capacity due to large port areas. Self-regulating, self-cleaning balanced rotary valve. Sizes 1¼" to 5". Publication 5201.

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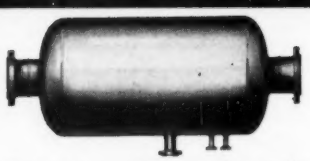

Protect superheaters from dirt and moisture. Protect turbines, engines and pumps. Improve efficiency and reduce steam consumption of prime movers. Publication 2725.

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DYNAPRENE is cured by the continuous vulcanizing process which assures a cord uniformly cured, free from deformation, and with accurately centered conductors.

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DYNAPRENE, a cord of the highest quality, can be depended upon to deliver power where and whenever it is needed.

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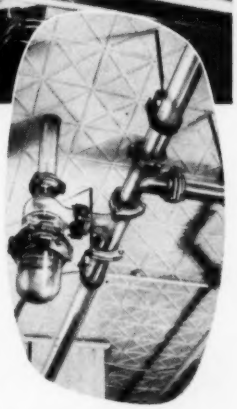

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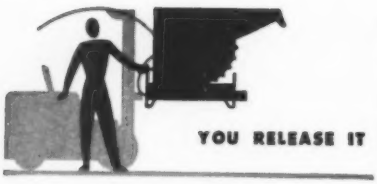

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DATA FILE

(Begins on page 218)

vantage with them, and discusses benefits. Gives engineering data on these units. Hapman Conveyors, Inc.

330 Conveying Systems—How this manufacturer's conveying systems are being used in handling dry pulverized and granular materials is shown in illustrated Bulletin FK-26, 16 pp. Types of systems and component parts are described and many typical installations pictured. Fuller Co.

331 Conveyor and Elevator Belting Tips—This 32-pp manual on installation, maintenance and care of conveyor and elevator belting, uses photos and drawings to show ways to improve belt service and lengthen belt life. Includes a discussion of belt design, covers, reinforcements and grades. Repair methods, splicing, and fastening are also covered, and there's a table listing common conveyor belt maintenance problems with their causes and remedies. The B. F. Goodrich Co.

332 Conveyor Belting — Twelve types of conveyor belting, for standard, heavy duty and special applications are described in this bulletin. Pictures the belting in use, and discusses in detail some of the impregnations, coatings. Main Belting Co.

333 Fork Truck Efficiency Test—This 8-pp article explains how to tell when fork trucks need corrective measures. Lists equipment and facilities necessary for truck testing, tells how to test traveling efficiency and hoist speed measurements, shows suggested test data forms. Mercury Mfg. Co.

334 Portable Hoists—Description and specifications of more than 100 types and sizes of portable hoists appear in 8-pp Bulletin CL. They include ratchet, lever hoists in roller and coil-chain models, with capacities from ¾ to 15 tons, standard, specialized spur gear hoists, Quik-Lift electric hoists. Coffing Hoist Co.

335 Manual on Electric Hoists — Catalog H-46, 40 pp, covers monorail and stationary hoists and car pulleys. Explains fundamental types of grabs, methods of hanging I-beams, types of hoist suspension, controls. American Engineering Co.

336 Shovel and Loader—Described in 12-pp Bulletin 1932 is a hydraulic crown and hoist shovel and loader incorporating mechanical features usually associated with big shovels. Illustrates, gives specifications, application information on both pneumatic traction and crawler traction models. Dempster Bros., Inc.

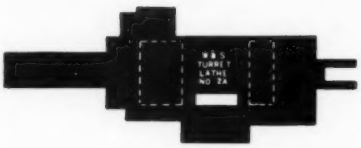
337 Railway Car Mover—"Reports from the Field on Trackmobile Savings and Advantages" tells how this small unit travels on road and track hauls and switches freight cars and requires only one operator. Stresses economy and easy handling. Whiting Corp.

338 Industrial Logistics — Form A-9516-4450 is a 12-pp booklet covering strategic handling of materials from raw state to distribution. Discusses master unit load and transportation cycle. Explains company's system of adapting all loads to four types of containers, assembling maximum numbers of these into master unit loads, and transporting them as single units. The Elwell-Parker Electric Co.

339 For Hopper Economy—"In Dollars and Sense" explains long run economy of company's self-dumping hoppers, showing how they operate and telling how they fit particular plant requirements. Illustrated with photos, gives dimensions, weight of a standard 1-yd model. Roura Iron Works.

340 Handling Baskets—Bulletin B-54 describes company's complete line of standard and custom-engineered Eezy-Stak parts handling baskets, for machining, washing, plating. Wire & Iron Products, Inc.

341 Industrial Lifts—This booklet presents a wide range of elevating equipment designed to step up efficiency and cut handling costs. Covers dock lifts, crossover bridges, sidewalk elevators, service lift. The Wayne Pump Co.



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- FOR GAUGING LIQUIDS OF ALL KINDS
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Do you have to shout at the top of your lungs, and listen with a finger in your ear . . . when phoning from your plant telephones?

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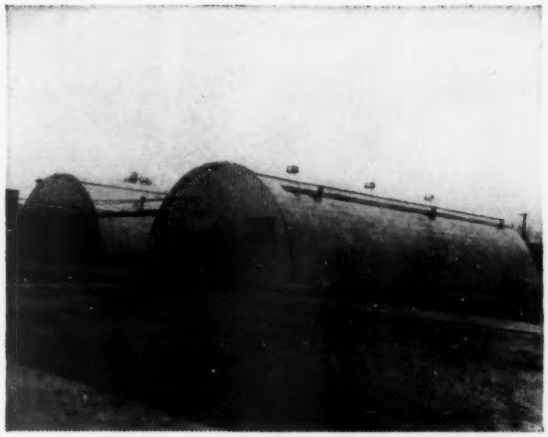

These quonsets at Pierce Governor Co., Inc., Anderson, Ind., were painted with reflective asphalt aluminum paint manufactured by Panther Oil & Grease Mfg. Co., Ft. Worth, Texas. Painting Contractor Jess Thrush.

ASPHALT ALUMINUM PAINT REDUCES INSIDE TEMPERATURES, IMPROVES WORKING CONDITIONS AT PIERCE GOVERNOR COMPANY

Faced with a heat problem during summer months which made working conditions unpleasant, this company painted the roofs of its factory and office buildings with asphalt aluminum paint. Here are the results, reported by the company:

"We are most happy to report that there was a noticeable difference in the temperature of the test spaces after the application of aluminum paint, and we will in all probability cover additional areas in the future. The application went on quite easily and for the amount of protection that we have obtained, the cost was entirely nominal."

Asphalt aluminum coatings can be applied with an ordinary roofing brush or spray gun . . . come ready mixed . . . require no thinning or heating. They protect roofs against leakage, insulate them, and by reflecting the sun's rays, reduce roof surface temperatures as much as 40 degrees. Result: greater comfort and work efficiency in factories, offices or schools . . . lower power and water bills for refrigeration plants, food lockers, milk coolers . . . lower evaporation losses from oil or gasoline tanks. **ALCOA does not make paint.** But we will gladly refer you to reputable manufacturers who do. Write today.

FREE BOOK
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Contains important information on proper application and selection of aluminum paint. Answers many industrial painting questions.

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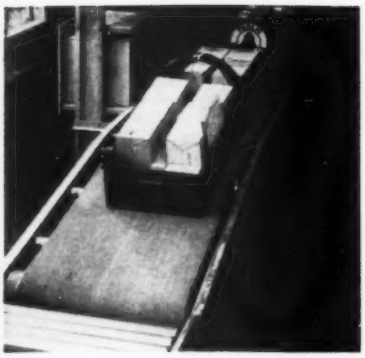

18 Western Electric Operations Use Imperial Belts

From Watertown, Mass., to Emeryville, Calif., and at operations in 16 cities in between, Western Electric Company uses Imperial Belts for many conveying jobs. In the Point Breeze Works, at Baltimore, an Imperial Belt moves heavy telephone cable terminal assemblies (left photo). At Western's Kansas City Distributing House another Imperial serves a general-duty conveyor (right photo).

Whatever the conveying or elevating task may be, there's an Imperial Belt job-designed to handle it. That's why so many companies like Western Electric call on Imperial to help fill their belting needs. Imperial Belts cost less to use because they are engineered for specific operations and constructed of long-wearing hard silver duck specially impregnated. Write for catalog and prices.

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1759 S. Kilbourn Ave.
Chicago 23, Ill.

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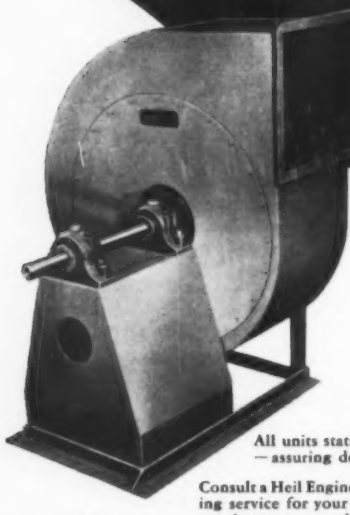
FOR EXHAUSTING CORROSIVE FUMES



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Furnished in a wide variety of sheet lining materials — or lighter protective coatings to fit your requirements.

Fan and housing constructed of extra heavy metal especially for lining applications.

All units statically and dynamically tested after lining application — assuring dependable long-life performance.

Consult a Heil Engineer for complete engineering service for your corrosive and ventilating requirements on solid Plastics or Lined Steel Exhaust Hoods, Ducts and Stacks.

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HEIL PROCESS EQUIPMENT CORPORATION
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DATA FILE

(Begins on page 218)

342 **Electric Hoist Manual**—Catalog 215-B offers 38 pp of engineering, application and ordering information on company's Load Lifter electric hoists. Presents hoists with hand operated trolleys and with power travel, hoists with lug suspension, hook suspension and push-type trolleys, and with hand-geared trolleys, hoists for low head. Manning, Maxwell & Moore, Inc.

343 **Trolley Hoists**—Bulletin DH-269, 2 pp, describes and pictures ½ to 3 t capacity armv-type trolley hoists, plain or geared, for use where a close, headroom assembly is required. Gives dimensional and capacity data, prices. Wright Hoist Div., American Chain & Cable Co., Inc.

344 **Portable Hoists**—This bulletin describes a lightweight air hoist in 2000, 1000, 500 and 300-lb capacities. Gives specifications, dimensions. Keller Tool Co.

345 **Handling Equipment**—Several of this manufacturers new products are described in this comprehensive 48-pp catalog, including steel boxes with lap joints, a stand and reel for handling steel coils and a new type nesting stacking box. Book presents a wide range of other materials handling equipment—stacking boxes, skid boxes, skids, racks, trucks and trailers. Palmer-Shile Co.

347 **Shock Absorbing Casters** — Twenty-pp Catalog FH-53 describes construction features of company's Floating-Hub casters, listing types and mountings now available. Load ratings for each type and size are provided. Stresses, by text and illustration, how these shock absorbing casters work, permit smooth travel over rough floors. The Bassick Co.

PACKINGS, GASKETS, SEALS

348 **Packings and Gaskets**—In this 40-pp belting and packing manual (NY-2697-P) are helpful charts plus information on the care, use and maintenance of rod and sheet packings and gaskets. A complete engineering section contains all necessary charts and tables for determining working specifications of packings. Also included are packing recommendation charts. New York Belting and Packing Co.

349 **Buyer's Guide on Packing**—Twenty-pp Catalog PC-101 brings together all material on company's Palmetto packings and includes data on packing for liquid pistons on inside-packed piston pumps. Greene, Tweed & Co.

350 **Metallic Packing** — This folder is devoted to company's elastic metallic packing intended for frictionless operation by means of an oil seal. Photos and text tell how seal is constructed, operates and is used. A. W. Chesterton Co.

LUBRICANTS, LUBRICATION

351 **Centralized Lubrication** — Featuring selection charts covering low and high pressure fluid lubrication systems for a wide range of industries and providing an explanation of operating principles of various types of systems, 24-pp Catalog 80 covers company's lubricant application equipment. Describes and pictures lubricant pumps, transfer and dispensing equipment. Lincoln Engineering Co.

352 **Automatic Lubrication** — Sixteen-pp Catalog L-52 describes force feed lubricators for all types of machinery. Illustrated, gives full design and construction details on company's open and enclosed type lubricators, available in capacities from 2 to 32 pints with 1 to 24 feeds per unit. Hills-McCanna Co.

353 **Force Feed Lubricators**—12-pp Catalog 25 G describes and pictures company's new Model 25 lubricator, a popular priced, general purpose unit adaptable to many applications. Lists machines for which it provides economical, automatic lubrication. Discusses drive arrangements. Manzel Div., Frontier Industries, Inc.

355 **Lubrication of Chain Drives**—Vol. 39 No. 8 of Lubrication offers a 10-pp discussion

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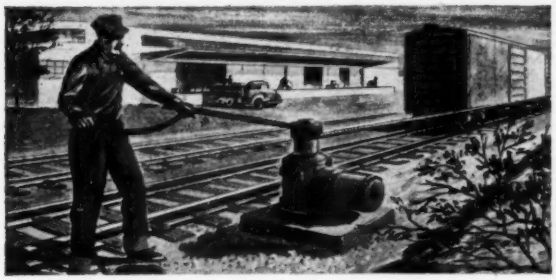

INSTALL a Lo-Hed Car Puller at your siding and cars will be loaded and unloaded without lost time. You'll also cut demurrage costs; eliminate shifting charges; abolish a cause of accidents... Lo-Hed Car Puller makes money *inside* a plant, too. Electrically-driven, rugged, it pulls anything in its capacity that can roll or slide. Write for full facts.

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No matter what type, thickness, shape or quantity required, you can count on Chicago-Wilcox for uniformly accurate gaskets, shims, washers or special stampings.

With 50 years accumulation of dies, chances are we can furnish just what you need without a die charge—thus reducing costs substantially and assuring on-schedule delivery.

Gaskets, shims and washers can be supplied in metallic, non-metallic and plastics . . . teflon, nylon, etc. . . . and in quantities to meet your production requirements.

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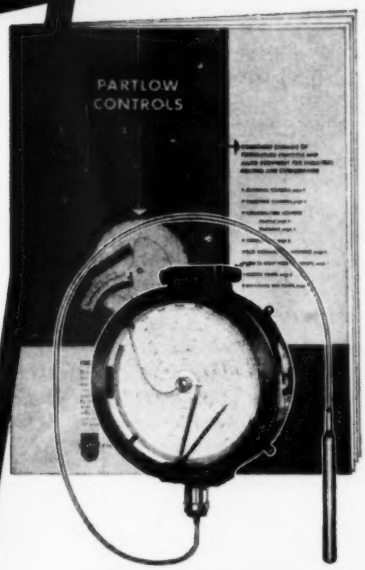

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SEND NOW for new condensed Catalog CC. See the seven different Partlow Mercury-actuated Recording Controls — designed to give you automatic process control, continuous temperature indication, permanent records, limit arrangements and hazardous location applications. Select controls tailor-made for your equipment — gas, oil, steam, water or electric. Available with electric or spring-driven chart drives — 24-hr., 48-hr., 7-day or any given cycle . . . 10 temperature ranges from -30° F to 1200° F.

All give you these important Partlow advantages:

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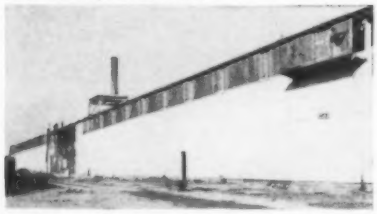
Stop This with RESOLITE

Shatterproof translucent panels save high labor cost of pane replacement . . . need no maintenance.



- **Rugged**—Shatterproof, strong as metal, fiberglass-reinforced Resolite has *unlimited* life without protective treatment or maintenance. There are no broken panes to replace.
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For further information see Sweet's Plant Engineering, Architectural or Industrial Construction Files or Write:

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236

DATA FILE

(Begins on page 218)

on chain drives and their lubrication. Covers types of chains, conditions affecting their lubrication, choice of lubricants. Includes table showing lubricant recommendations for chain drives. The Texas Co.

356 **Proper Lubrication**—Presenting proper lubrication as the life blood of all machinery, 36-pp Lubriplate Data Book 54-1 is a helpful treatise on modern lubrication practice. Gives product data on both oil type lubricants and greases and discusses choice of lubricants for use in applications involving heavy loads, high speeds, extreme temperatures, water conditions and other metal working. Provides tables of specific recommendations for various classes of equipment used in chemical processing, metal-working, other industries. Lubriplate Div., Fiske Brothers Refining Co.

357 **High Temp Lubrication**—How "dag" colloidal graphite has been used successfully in various lubricating applications involving temperatures up to and over 2000 F is described in Bulletin 423. Acheson Colloids Co.

PUMPS, COMPRESSORS

358 **Centrifugal Compressors** — Twelve-pp Bulletin 109 describes and pictures single-stage centrifugal compressors for delivering large capacities of pulsation-free air or gases. Their functions, applications, ratings, construction features, arrangements, and methods of control are presented. American Blower Corp.

359 **Multi-Stage Compressors**—Featured in 36-pp Bulletin 116 is a presentation of engineering data and performance characteristics to enable plant engineers to approximate power requirements, rotative speed and discharge temperature for most multi-stage centrifugal compressor applications. Clark Bros. Co., Inc.

360 **Compressors** — Bulletin A72, 36 pp, gives construction, operation information on company's Class WN-114 heavy-duty air compressors. Illustrates seven models of compressor as a single unit for displacement capacities from 1186 to 1948 cfm, twin units furnishing up to 3896 cfm. Joy Mfg. Co.

361 **How to Solve Pumping Problems**—A new printing of this popular 36-pp booklet makes it again available to plant engineers. Filled with helpful technical information, explains design and operation of rotary gear pumps and discusses factors of pumping problems, covering some sample ones in detail. Illustrated, provides friction loss and conversion tables, electrical data, viscosities of liquids, construction materials for handling various liquids, resistance of valves and fittings to flow of fluids. Geo. D. Roper Corp.

362 **Screw Pumps**—Twelve-pp Bulletin S-205 is devoted to company's standard gear-in-head, high pressure long body gear-in-head, and standard vertical gear-in-head types. Basic construction and design are discussed in detail and there are sectional views with indicated features, also installation pictures. Dimensions are included. Warren Steam Pump Co., Inc.

363 **For Abusive Pumping Jobs** — Catalog 4906, 36-pp, covers centrifugal pumps for wide, industrial use and especially adapted to handling ashes, abrasive mixtures, slurries, hot and corrosive liquids. It describes several basic types; a horizontal shaft, single-stage side suction pump; a horizontal shaft, single-stage, rear-entrance automatic priming pump; vertical shaft pumps with standard, overhead and quill bearings for wet pit applications. Nagle Pumps.

364 **Data on Pumps**—This 12-pp condensed catalog covers turbine-type and centrifugal pumps for a wide range of industrial uses. Gives construction specifications, capacities, application information as well as reference to specific literature on each type. Fully illustrated. Also includes data on mixed flow pumps, sump pumps. Aurora Pump Co.

365 **Condensed Pump Data**—Form 4383-J covers more than 20 types of general service pumps, rotary pumps, sump and drainage

RESEAT VALVES AND BIBBS

PAYS FOR ITSELF ON FIRST 2 OR 3 JOBS!

Don't junk expensive globe or angle valves, bibbs, fixtures—reseat them! Order Skinner *Valve* and *Bibb Reseater*. Easy to use. Guaranteed cutters leave seat glass-smooth, level, tight.

1/4" to 2" $47.75
1/4" to 3" $62.90

M. B. SKINNER CO.

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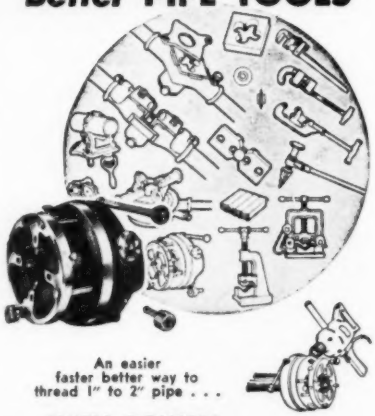
***Better* PIPE TOOLS**



An easier faster better way to thread 1" to 2" pipe . . .

WITH POWER!

This light (26 lb.) compact Portable Power Pipe Threader goes to the job—is ***operated with a ½" portable electric drill.*** 1 set of High Speed Steel Chasers does all sizes—just move indicator to 1", 1¼", 1½", or 2" marking. Clamp on pipe and apply drill to drive square. The rest is automatic. Operating on anti-friction bearings with automatic lead, it's *a fast*, easy way to get smooth, accurate threads.

Write for Catalog

ARMSTRONG BROS. TOOL CO.

"The Tool Holder People"

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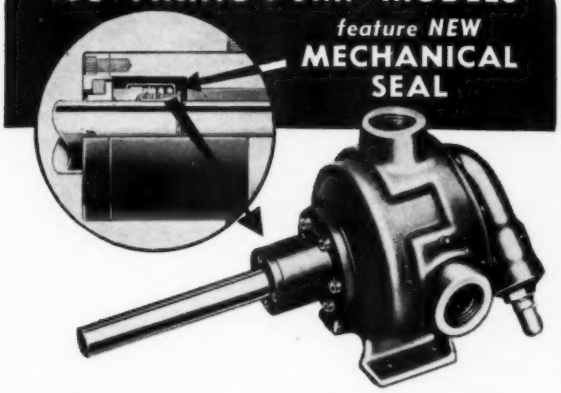
135 VIKING PUMP MODELS

feature NEW MECHANICAL SEAL



VIKING pumps, ranging in sizes from 10 to 300 gpm, are now available with new Viking leak-proof mechanical seals. These same pumps are also equipped with bearings requiring no outside lubrication whatsoever.

Both features are available on regular line of pumps, all-weather single and twin units and Underwriter's approved models. See what these latest lines of Viking pumps can do for your pumping problems.

VIKING AN HONORED NAME IN PUMPING

Ask for Bulletin SP-336Z today.

See Our Catalog in Sweet's

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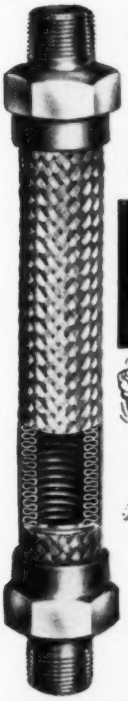
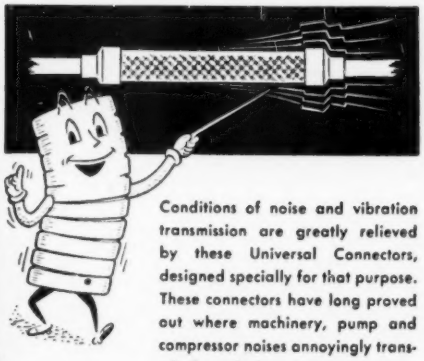


✓ DAMPEN NOISE
✓ ABSORB VIBRATION
with

UNIVERSAL VIBRATION CONNECTORS



Conditions of noise and vibration transmission are greatly relieved by these Universal Connectors, designed specially for that purpose. These connectors have long proved out where machinery, pump and compressor noises annoyingly transmit through the system.

Available in standard lengths with female or male sweat-fittings for attaching to copper tube lines—or with solid male NPT threads for coupling to threaded pipes.

Send us your problem for recommendations. Ask for Catalog U-111 for your file.

UNIVERSAL METAL HOSE CO.

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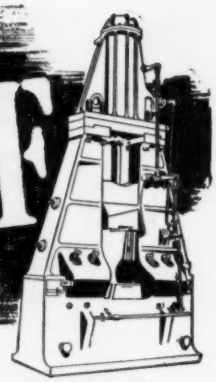

Palmetto Pyramid: 17 to 7 — At the Canton Drop Forgings and Mfg. Co., a 5000 lb. Steam Drop Hammer was used to compare Palmetto Pyramid #2500 with a conventional square packing. Results: 24 lbs. of square packing were used in 7 weeks. After the initial packing — rings were added 2 or 3 at a time. This means approximately 3 complete sets of square packings in 7 weeks.

ONE SET OF PYRAMID #2500 (NO RINGS ADDED) LASTED 17 WEEKS!

PALMETTO PYRAMID

A combination of Strength and Adaptability. Made of endlessly folded fabric, it can't split or fray; being molded, it is much denser and more wear resistant than conventional packings; asbestos-reinforced, it can withstand temperatures of 600° F.; patterned on a square, each ring provides a solid base for the one above. This strength, combined with the flexibility of Palmetto Pyramid's design, provides the formula for real heavyweight service.

FOUR WAYS FLEXIBLE

1. Single-line contact — facilitates instant response to pressure changes.
2. Lip curve — provides free entrance for pressure medium, assures positive sealing action and thorough lubrication.
3. Lateral surface — is largely sealing surface. Means fewer rings — less friction — longer life.
4. Automatic sealing—means tighter sealing with increasing pressure. But no binding—for adjustment is self compensating through internal pressure.

Palmetto Pyramid not only can take it. It can take it longer. Because it *rides with the punches* Send for catalog PC-102 covering complete Palmetto line.

PALMETTO Packings

packing more performance into every application

GREENE, TWEED & CO. North Wales, Pa.

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Clean Up IN A POWER PLANT CAN BE TOUGH ON A PUMP!

BUT NOT ON A Nagle TYPE "SWO"

This pump welcomes tough jobs. Water end parts are of wear resistant manganese steel or one of a choice of other wear or corrosion resisting alloys. There are *no* submerged bearings—*no* stuffing box. Readily handles thick mixtures. Performance Records on type "SWO" pumps over a 10-year period indicate extremely low replacement parts costs. Whether for continuous or intermittent service, it's the Nagle "SWO" for dependable handling of drainage, tailings, slurries, or froths. Unit illustrated is performing highly satisfactorily in a midwest lead mill.

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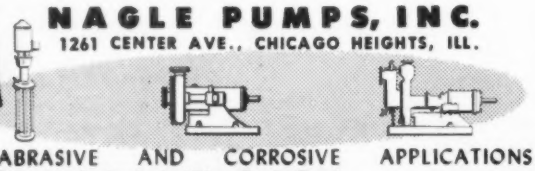
NAGLE PUMPS

NAGLE PUMPS, INC.
1261 CENTER AVE., CHICAGO HEIGHTS, ILL.



PUMPS FOR ABRASIVE AND CORROSIVE APPLICATIONS

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SAVE BELTS, bearings & power with Chesterton Belt-Flo

BELT-FLO is a remarkable new development in liquid dressing which enables even slack belts to deliver all generated horsepower from the motor to the machine. BELT-FLO preserves all leather, rubber or fabric belts. Does not contain rosin, asphalt, oil or any other injurious materials customarily used. Use BELT-FLO *now* and immediately stop wasteful loss of power. Use BELT-FLO *now* and stop belt deterioration due to rosin type dressings. Use BELT-FLO now and stop bearing deterioration caused by unnecessarily tight belts. Save belt dressing costs with BELT-FLO which lasts up to 20 times longer. BELT-FLO will not collect dust and dirt — will not glaze or lump up on belts, is non-inflammable — non-poisonous — non-staining — clear in color — does not dry out or lose its pulling power. SPRAGRIP is BELT-FLO in pressurized cans. Particularly recommended for V belt use and all hard-to-get-at belts. Where application safety is a factor specify SPRAGRIP. Sold by all Transmission and Industrial Supply Jobbers *everywhere*.

A. W. CHESTERTON CO.
6 Ashland St., Everett 49, Mass.
America's Oldest Manufacturer of Mechanical Packings.

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DATA FILE

(Begins on page 218)

pumps, condensate units, self-priming units, stainless steel pumps and high pressure pumps. In easy-to-find tabular form, each model is pictured along with its characteristics, applications, and features. Goulds Pumps, Inc.

366 **Bronze Pumps** — Application information, construction features, dimensions and capacities of a line of bronze pumps are given in this 12-pp bulletin. Illustrated with photos, sketches, it covers several types of rotary gear pumps, also an open impeller centrifugal pump for limited volume liquid transfer. Oberdorfer Foundries, Inc.

367 **Installing a Pump** — Blaming many pump operating troubles on improper pump selection and installation, this 8-pp technical article tells what should be taken into consideration when ordering a pump. Titled "Studying the Installation," it discusses head, viscosity, pipe friction, suction lifts, horsepower and materials. Illustrated. Viking Pump Co.

OTHER EQUIPMENT

368 **Fire Extinguisher**—How to Extinguish a fire in 11 sec by use of the Fyr-Fyter instant extinguisher with "loaded stream" chemical liquid. "Karbaloy" is pictured in Bulletin F-1158. Lists advantages of 500 lb stainless steel model. The Fyr-Fyter Co.

369 **Continuous-Cast Bronzes** — This 12-pp bulletin describes, illustrates Asarco continuous-cast bronze products including copper alloy rods, valve guides, air brakes, packaging machinery. Tables include typical physical properties of foundry alloy cast by three methods; impact tests revealing high safety factor for heavy-duty parts. Lists specifications, sizes, weights on rods, bars. American Smelting and Refining Co.

370 **Metal Hose Manual** — Technical Data Book U-111, 24 pp, includes information on application, temperature ranges of various types of metal and wire braided hose, dimensions, couplings, assemblies. Types of hose manufactured by this company are illustrated and described, including seamless all-metal flexible pressure hose; interlocked suction, blower and conveyor hose; square locked conduits and flexible spout tubing; double wire-braided hose for high pressure. Universal Metal Hose Co.

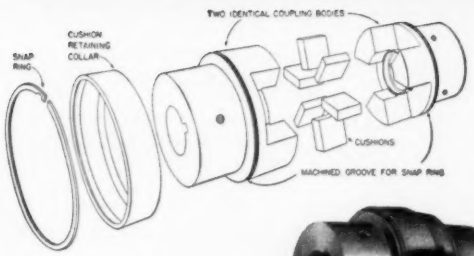
371 **Preheating Combustion Air**—This well-illustrated 36-pp booklet explains fuel savings and increased performance made possible by using waste heat in flue gases to preheat incoming combustion, air. Also covers increased boiler output, ability to use lower grade fuels, other advantages afforded. Booklet contrasts regenerative with recuperative preheaters; explains operating principle and structural details of the Ljungstrom air preheater. Industrial applications for other than power boilers are covered. Air Preheater Corp.

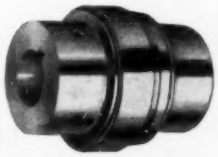
372 **ABC's of Dryness**—Eight-pp Bulletin 16.0.081 presents packaged dehydration units for efficient drying of air or other gases. Tells what these dryers can do, what they will remove dryness from and where they are recommended for use. Explains drying operation; discusses absorbents and equipment utilized, giving construction details and sizes offered. Typical arrangements for both full-stream and split-stream reactivation are diagrammed, and selection information included. Equipment Div., J. F. Pritchard & Co.

373 **Piping for Permanence**—In presenting corrosion fundamentals of plumbing and heating systems, this 32-pp illustrated booklet contains data based on analysis of thousands of wrought-iron piping systems. Chapters are devoted to requisites of a piping material, building-piping systems, and water and its problems. Includes many service records. A. M. Byers Co.

374 **Engineered Conveyor Systems**—Catalog 853, 32 pp, illustrates conveyor systems in use in a wide range of industries showing how they suit handling requirements involved. Roller, wheel, belt, chain, overhead trolley and elevating conveyors are included, also spirals portable power conveyors ball transfers and special equipment. Mathews Conveyer Co.

LOVEJOY FLEXIBLE COUPLINGS





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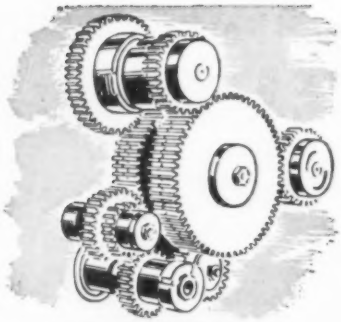

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(Begins on page 218)

376 Industrial Ovens — Thirteen types of company's Convectioneered ovens, which apply principles of forced convection heating to various industrial processes, are illustrated and described in 12-pp Bulletin 200. These ovens serve foundries, metal finishers, plastics producers. The W. W. Sly Mfg. Co.

377 To Keep Wire Rope at Work—Form 3547 is an 82-pp handbook titled: "Here's How to Keep Your Wire Rope Working," and filled with practical tips on care and use of wire rope. Tells how wire rope is constructed, what types are suited to various jobs, how to install it. Covers such subjects as abrasion, lubrication, avoiding kinks, alignment of sheaves, winding on drums, bending fatigue, wire breaks, when to discard a wire rope. Wire Rope Div., American Chain & Cable Co., Inc.

378 Industrial Equipment — Bulletin WP-1099-B61, 16 pp, describes manufacturer's industrial equipment including centrifugal refrigeration systems, condensers and coolers, steam power plant equipment, water conditioning deaerators and rotary pumps. Gives features, types, sizes, capacities, and describes their application. Worthington Corp.

379 Neoprene Design Book—This illustrated bulletin discusses the properties of Neoprene, showing how they are utilized in products made from this chemical rubber. Covers its toughness, hardness range, air retention, performance under load, at extreme temperatures, flame and chemical resistance. Rubber Chemicals Div., E. I. du Pont de Nemours & Co.

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381 Slings for Industry—Form 5308 is a compact reference bulletin packed full of sling data. Lists slings of approximate breaking strengths of 1000 lb to 243.4 tons, along with their safe loads for various angles of use. Macwhyte Co.

382 Industrial Leathers—These illustrated data sheets cover company's leather products and include specifications on various types of leather belting. Also gives data on leather packings for hydraulic and pneumatic equipment. J. E. Rhoads & Sons.

383 Rupture Discs—Catalog 77-30, 6 pp, fully illustrated, gives construction features of a rupture disc for low pressure and highly corrosive applications, sizes 2 through 10 in., and rupture pressures from 5 to 100 psig. Discusses operation, pressure ranges, manufacturing tolerance, choice of materials available. Black, Sivalls & Bryson, Inc.

384 Socket Head Fasteners—Advantages of company's screw products are described in this folder. Included are socket head cap screws, shoulder screws, flat head socket cap screws and button head socket screws. Also described are socket screw keys, square head set screws, pressure plug and dowel set screws, pressure plug. Standard Pressed Steel Co.

385 Steel Reservoirs, Standpipes — This 24-pp booklet pictures installation of reservoirs of 50,000- to 10,000,000-gal capacity, having cone, umbrella or ellipsoidal roofs and ornamental structures with special architectural features. Provides table of standard capacities, information on foundations, use of suction tanks for fire protection. Chicago Bridge & Iron Co.

386 Engineered Vibration Control—Bulletin 104 presents spring, cork and rubber mountings, discusses advantages of each and use alone or in combinations. Provides helpful selection chart covering a wide range of machines, showing recommended and alternate methods of isolation. The Korfund Co.

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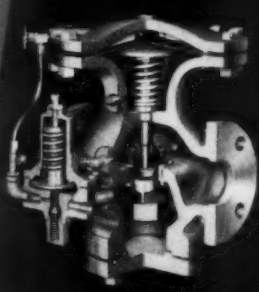

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Professional Analysis Method

ENGINEERING ANALYSIS by D. W. Ver Planck and B. R. Teare, Jr. Size 9 by 6 in.; 344 pp.; Published by John Wiley & Sons, Inc., 440 Fourth Ave., New York 16, N. Y. Price $6.00

MORE THAN TWENTY years experience of teaching courses on analysis lie behind the preparation of this book regarding the thought process in handling engineering problems.

Although the mathematics involved in the solution of problems are not neglected, they are not stressed. What is considered of prime importance in this publication is how the problems are handled. The book is concerned with the approach, reasoning for selecting mathematical relations, testing one's work, analyzing the result instead being satisfied with just an answer. The authors offer exemplary problems showing how the professional method is applied.

It is recommended that readers have a working knowledge of calculus to better appreciate the content. Differential equations that appear in two sections can be omitted, according to the authors, without affecting the intelligibility of subsequent material.

Here are some of the main chapters in the book: Application of professional method; the understanding of principles fundamental to engineering; and interpretation of the mathematics.

A collection of problems designed for student development in the professional method of handling engineering assignments appears in the final portion of the book.

Engineering and Maintenance

TECHNIQUES OF PLANT MAINTENANCE and Engineering. Size 11¼ by 8½ in.; 291 pp; cloth bound. Published by Clapp & Poliak, Inc. 341 Madison Ave., New York, N. Y. Price $7.50.

FIFTH IN A SERIES, this volume covers the proceedings of the 1954 Plant Maintenance and Engineering Conference that was held in Chicago. It expresses the opinions and findings of men experienced in work involving plant operation and upkeep.

One general session reported in the book is devoted to the subject of scheduling and planning of maintenance work. Case examples involving plants with over 1,000 and 150 shop employees are included. In addition to this, the volume contains general session proceedings on maintenance cost control and budgeting in plants of 2,300 and 650 employees.

Other subjects were handled in sectional conferences. A portion of these is as follows: Preventive maintenance —pros and cons; the place of sanitation in plant maintenance; insecticides in rodent control; getting management's O.K. on the maintenance program; waste disposal problems and solutions.

Among the twenty round table discussions included in the book are the following topics: power plant equipment; material handling equipment; lubrication; plant buildings; maintenance stores and janitor work.

Metal Market Data

METAL STATISTICS 1954. Size 6 by 4 in.; 848 pp; cloth bound. Published by American Metal Market, 18 Cliff St., New York 38, N. Y. Price $3.00.

GREAT DEAL of information on metals in the form of tabulated data is presented in this small but compact book. Along with the prices of various metals, the volume presents import, ex-

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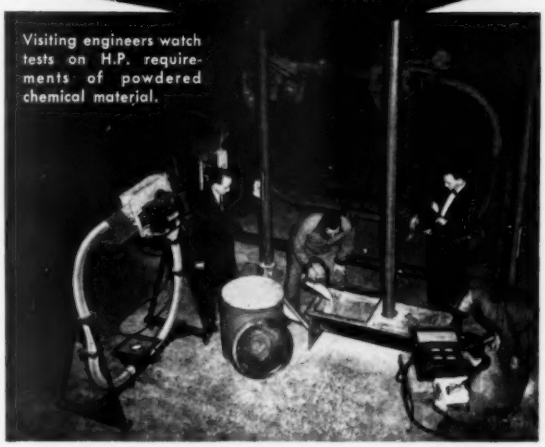

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port, and production figures. Among some of the sources of statistics in this volume are the following: U. S. Bureau of Mines; Copper Institute; Lead Industries; American Zinc Institute; American Iron and Steel Institute.

There is a buyers' directory at the end of the book which groups firms according to the product they supply.

Paint Application and Surface Preparation

GOOD PAINTING PRACTICE—Vol. I, Size 11 by 8½ in.; 423 pp; illustrated; cloth bound. Published by the Steel Structures Painting Council, 4400 Fifth Ave., Pittsburgh 13, Pa. Price $6.00.

USEFUL and extensive information on painting was prepared for this manual by a group of specialists. The work was edited by J. Bigos who is the Director of Research of the Steel Structures Painting Council.

Questionnaires played an important part in the planning of this book. They were sent to various paint users and their representative groups and thus information based on actual experiences was gathered. Along with tests, inspections and other studies, the questionnaires helped in the preparation of this volume.

Each of the 18 chapters in this book is individually authored. Some of the sections offer the views and findings of two or more people. The multiplicity of authors serves to present a variety of ideas on painting and surface preparation and tends to make the coverage more thorough.

Among the chapters of this informative and interesting book are the following: Painting of industrial plants; causes and prevention of paint failures; inspection; shop painting of steel in fabrication plants; the painting of steel tanks; comparative costs; simplified theory of corrosion; practical aspects, use and application of paints.

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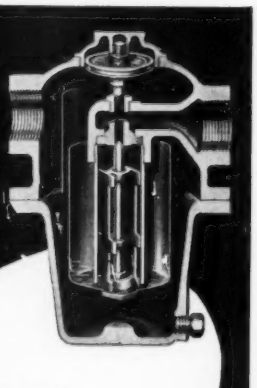

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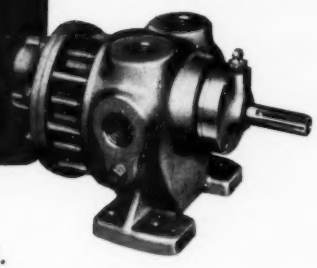

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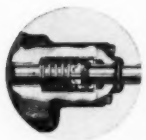

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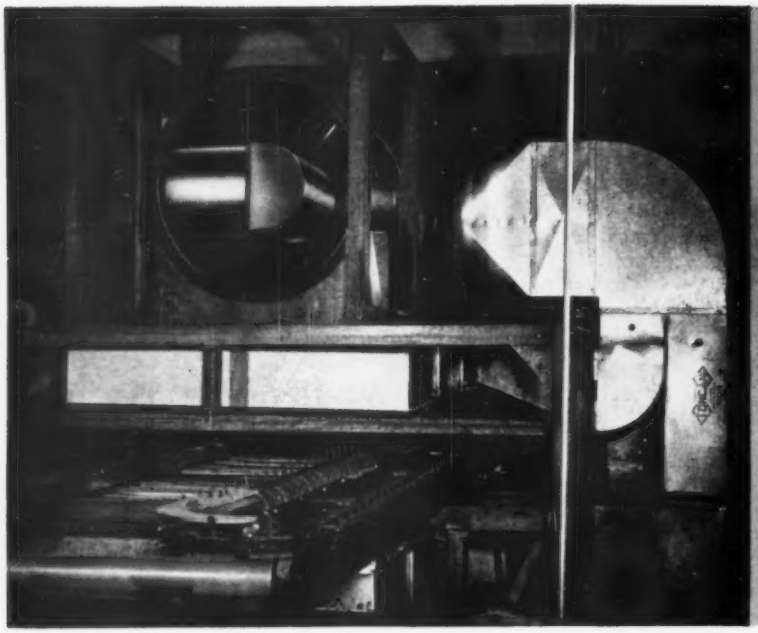

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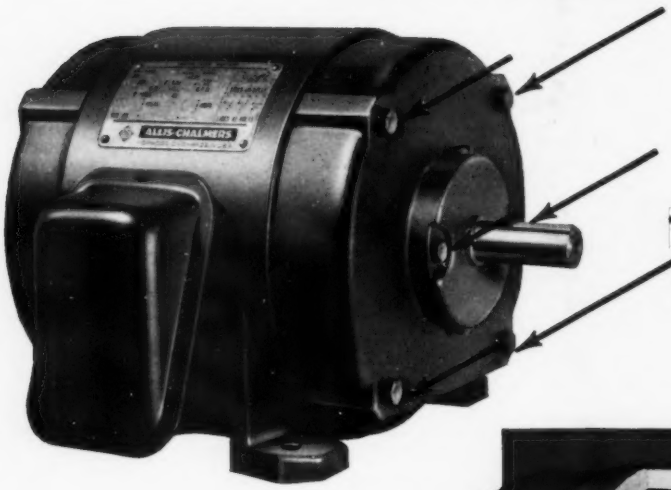

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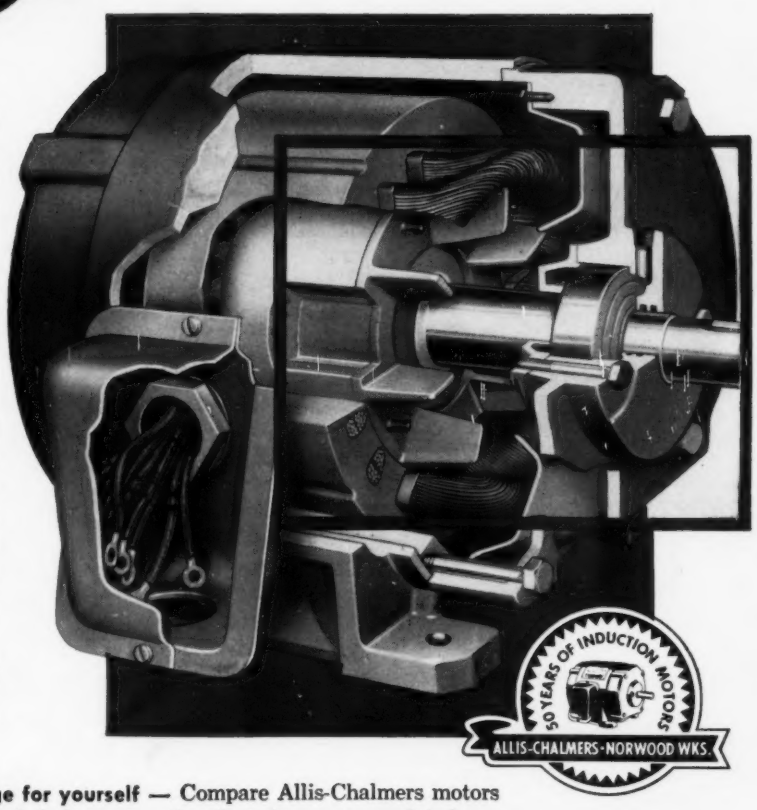

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